Potential to grow informal waste recycling in semi-urban areas: Case of the P.E.A.C.E. recycling buyback centre in Senwabarwana, Limpopo.

by

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ABSTRACT

This research aimed to investigate an area of research that has largely been overlooked in the past, that is, the efficiency, profitability and sustainability of informal waste recycling in semi-urban areas. In exploring the research topic, a recycling buyback centre was used as a case study. The centre facilitates collection, sorting and selling of waste and is located in Senwabarwana, Northern Limpopo Province. Here the P.E.A.C.E (Planning, Education, Agriculture, Cooperatives and Environment) Foundation, an organisation looking at rural poverty alleviation in South Africa, initiated a flagship recycling buyback centre as a community project. This research picks up on prior research that was conducted on a similar project initiated by the same organisation in Ndumo, KwaZulu Natal. Even though the location is different from KwaZulu Natal, both Senwabarwana and Ndumo are faced with similar challenges affecting social, economic and environmental circumstances. Five objectives were identified to provide structure to this research.

Through action research, the study assessed the sustainability of this recycling buyback centre with regard to the impact on social, economic and environmental factors within Senwabarwana. It also covered problems experienced in rolling out waste management initiatives within the semi-urban study location and assessed the municipal framework with regard to waste and how waste is managed and recycled. Furthermore, analyses of the waste data generated at the recycling centre was examined that culminated in offering solutions to the identified problems. Recommendations for acceptable practices in semi-urban waste management are made to enable further research and potentially up-scaling the project for application in other geographic areas.

The study reports both qualitative and quantitative data collected through the investigation of the case study in the start-up phase. The data gathering was done through administering questionnaires to waste pickers associated with the case study centre. Telephonic and face-to-face interviews and secondary data were interchangeably used to address each of the five objectives. The results from the data gathered show that, if properly coordinated and structured, informal waste recycling in semi-urban communities is possible and can contribute positively to the socio-economic and environmental development of these areas. It is envisaged that this study would contribute to the body of knowledge already in existence, whilst also creating an opportunity for further academic research and input within this field to enable the scaling-up of such initiatives.

Key terms: Semi-urban, informal, waste management, recycling, buyback centre, cooperative model, waste, collectors, recyclable, environmental, waste data, development, illegal dumping

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DEDICATION

For Lorraine, gone but never forgotten…

Table of Contents

List of Figures

List of Maps

List of Photographs

List of Tables

Acronyms and Glossary of Terms

Cash flow	Financial status based on income and expenditure
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
Donkey Owners	Group of individuals collecting waste at the case study using donkeys and customised carts
Enterprise	A business
IDP	Integrated Development Plan Document highlighting priority development areas of a municipality
ISWA	International Solid Waste Association
IWMP	Integrated Waste Management Plan
Middleman	Intermediate market that buys waste from waste collectors
P.E.A.C.E Foundation	Planning, Education, Agriculture, Cooperatives and Environment Foundation, an Organisation addressing rural poverty alleviation
PET	Polyethylene Terephthalate
PETCO	PET Recycling Company of South Africa Organisation that facilitates collection of PET in South Africa
Scale up	Expand on (impact/effect/area of influence)
Stakeholder	Parties/individuals/organisations involved in the project
Start-up	In the early stages before becoming profitable
Thinana Cooperative …..……..	Registered enterprise that runs the case study buyback centre on a day to day basis
UNEP	United Nations Environment Programme
Value chain	Line of activities involved in a processing from beginning to end
Waste collectors	Group of individuals collecting waste using trolleys on foot
WIEGO	Women in Informal Employment: Globalising and Organising

Chapter 1
INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This chapter serves as an introduction to the study. It offers the background, objectives, research aim and motivation and the rationale why the topic was chosen for investigation.

1.2 BACKGROUND

According to the United Nations Environment Programme (UNEP), across the world, and particularly in cities and urbanised areas, there is a considerable amount of informal sector activities in waste management (Wilson, 2015). This sector has the capacity to step in and provide waste collection services where solid waste management (SWM) systems are absent, as is the case in Zambia where more than 30% of waste collections are conducted through the informal sector (Wilson, 2015). Where landfilling and waste dumping are the predominant means of disposing waste, composting and waste recycling are viable strategies that can convert waste into assets and assist in generating employment and income (Simelane & Mohee, 2012).

In South Africa, recycling buyback centres are viewed as links between informal sector activities in waste management and recycling companies, thereby creating both formal and informal employment in the recycling value chain (Mogotsi, 2008; Viljoen, Schenck & Blaauw, 2012). Informal jobs include waste collection activities by collectors and reclaimers at landfills, street collectors and individuals who have access to transport of the waste. Buyback centres inevitably rely heavily on these informal waste collectors who feed them with waste which they can sell to either other bigger buyback centres or manufacturers (Viljoen *et al*., 2012). In the process of buying the waste, the buyback centres create jobs, offer solutions to some environmental problems caused by ineffective waste management and improve their viability as businesses through increasing waste volumes that they can resell (Mogotsi, 2008).

Waste and how it is managed is now getting wide attention because of the threat it poses to both nature and mankind, having the potential to deplete the ecosystem (Nair & Jayakumar, 2008). The Polokwane Declaration of 2001, which is an outcome of the first National Waste Summit in South Africa in 2001, recognises that waste management is a priority for all in South

Africa to the extent, it called for effective resource use and management to protect the environment (Department of Environmental Affairs and Tourism, [DEAT] 2005). The declaration states that the waste goal for South Africa was to reduce waste generation by 50% by 2012 and disposal by 25% and to develop a plan for zero waste by 2022 (DEAT, 2005). This is an indication that urgent action was required in order to address challenges brought about by ineffective waste management. At a metropolitan level, the City of Johannesburg has held two waste summits (2013 and 2015), with the declaration from the 2015-edition of the summit having noted the importance of input from academics in coming up with formal and informal best practices in waste management (City of Johannesburg, 2015). This not only gives motivation for the role of academia in waste management issues, but shows further how waste issues are on the agenda in South Africa.

Samson (2009) states that a number of individuals at a global scale are sustaining themselves and their families through reclaiming re-usable and recyclable materials that would otherwise have been cast away as waste. These include the kerbside collectors using trolleys or, due to financial constraints and lack of economic opportunities, those found at landfill sites. The growth in cities and urbanisation leads to an increase in waste that is generated (UNHabitat, 2014). Waste collection and sorting in the informal sector has become widespread due to this growth and, because they are labour-intensive, they become potential areas where jobs can be created (Viljoen *et al*., 2012). However, the academic understanding of the role of buyback centres, which buy recyclable waste materials from waste collectors, has been neglected in the recycling value chain (Viljoen *et al*., 2012). On the other hand, solid waste management issues have mainly focused on cities because of the assertion that waste generation is mostly associated with the economic status of an area (Shekdar, 2009). Semi-urban areas have not been given much attention with regard to their waste management activities.

A political case for action is strengthened when waste management is assessed as an entry point to address sustainable development issues, as it has links to global challenges that include health, climate change, poverty alleviation and sustainable production and consumption (Wilson, 2015). Therefore, this research investigates waste management through informal waste recycling and the sustainability of recycling through a case study buyback centre in South Africa. Focus is narrowed down to a semi-urban area in Limpopo Province, where an existing buyback centre has been set up by the P.E.A.C.E Foundation as a poverty alleviation tool. Investigating the contributions of the buyback centre in line with the municipal framework on waste management, is crucial in determining the potential impact to be realised from waste management and recycling in other semi-urban areas throughout South Africa and within the Blouberg Municipality.

1.3 DEFINITION OF KEY TERMS

Definitions of terms are given based on how the terms are used in this dissertation. The terms to be defined are presented in bold.

The National Waste Management Strategy defines **waste** as any substance that is discarded regardless of whether it can be reduced, re-used or recycled (DEA, 2011). **Informal sector** refers to the part of the economy, which is not regulated by government structures. This includes work that takes place in unincorporated enterprises that can either be small or unregistered (WIEGO, n.d.). In this research, the informal sector will also cover **waste collectors/pickers,** who are people pushing trolleys that contain recyclable materials (paper, plastic, scrap metal and cardboard) to be recycled via waste merchants (Mamphitha, 2011). Waste collectors often sell their recyclable waste to **buyback centres**, which are centres that allow waste collectors to sell recyclable materials (Viljoen *et al*., 2012).

Sorting of the waste can be regarded as a way of separating and grading it, based on the type of waste. For instance, glass bottles can be separated from cardboard. They can be further graded based on their colour. This definition is also adopted in this research. **Recycling** is defined as a recovery process in which waste is processed into products but does not include energy recovery from waste (Eurostat, n.d.). In this study, it also covers the process of collecting waste material, sorting it and selling it so that it can be re-used by manufacturers or end-users. This includes **baling** of the waste which is tightly tying up large amounts of waste materials (Cambridge Dictionary, n.d.). **Up-cycling** is the making of new products by modifying the physical appearance of a discarded waste material.

A **semi-urban area** is a low density, scattered or fragmented form of urbanised land, which neither falls under core urban classification nor the real country side or rural areas (Meeus & Gulinck, 2008). In this case study, it specifically refers to Senwabarwana under the Blouberg Municipality in Limpopo.

A **cooperative** is defined as an association of people who have common socio-economic aspirations through a jointly owned and controlled enterprise (International Cooperative Alliance, n.d).

1.4 PROBLEM STATEMENT

Informal waste recycling has been focused on around urban centres due to high waste volumes generated in these areas. However, rural and semi-urban areas, though they generate much less waste, are also faced with serious waste management challenges. Where no proper waste disposal methods exist, open waste dumping and burning end up being means of disposing of

their waste, which results in a number of environmental, human and animal health problems (Nair & Jayakumar, 2008). No proper framework exists in the semi urban area of Senwabarwana to deal with waste that is generated in an environmentally sustainable way, as the waste ends up being sent off to the local dumpsite and in some instances dumped illegally.

According to Integrated Development Plan (IDP) of the local municipality, there is a backlog in waste management services owing to capacity and financial constraints, which further adds to the environmental challenges, because waste becomes a problem which they cannot deal with adequately (Blouberg Municipality, 2012). At the same time, initiatives that look at using waste to sustain livelihoods, alleviate poverty and divert waste from landfill sites have not yet been explored fully within the academic field of semi-urban areas, as they have focused mainly on urban areas. These initiatives include, but are not limited to, recycling programmes and recycling buyback centres. Consequently, there is an opportunity to explore the impact of these innovations and how they can influence the socio-economic and environmental spheres of semi-urban areas, in this case, Senwabarwana.

1.5 RESEARCH AIM

The purpose of the research is to evaluate the impact of the P.E.A.C.E Foundation recycling buyback centre in Senwabarwana. This is a project that has been operational since 2014. The findings could contribute towards scaling up and rolling out further similar initiatives in other semi-urban areas.

1.6 OBJECTIVES OF RESEARCH

Objectives were identified on the basis of the case study of a buyback centre. For the first objective, the social impact that includes job creation and establishing the nature of relationships that exist at the recycling centre will be examined. The economic impact will cover income generation through buying and selling of waste, whilst the environmental impact will look at compliance issues pertaining to the recycling centre together with observations on how waste is handled there. Problems to be covered in the second objective include problems observed by those involved at the recycling centre, and those identified by different stakeholders including those who are directly or indirectly involved with waste recycling initiatives and cooperatives.

Assessing the framework of the Blouberg Municipality, with regard to waste management and recycling, will involve analysing the Integrated Waste Management Plan and the Integrated Development Plan documents whilst giving an analysis of waste data generated at the buyback centre which will enable quantification and qualification of waste materials that are traded at

the centre. The fifth objective concludes the study through providing solutions to challenges experienced in semi-urban waste recycling, centred on the case study and providing recommendations and acceptable practices for overcoming some of the challenges.

The following five (5) objectives identified creates a structure for this study. They are all centred on the recycling centre operations and issues that directly affect the centre, such as the policy framework and problems faced in rolling out such centres within the case study.

Objective 1: To assess the sustainability of this buyback centre with regards to its social, economic and environmental impacts;

Objective 2: To investigate the problems faced in rolling out semi-urban recycling and buyback centre initiatives;

Objective 3: To assess the current municipal policy and operational framework on waste recycling within the Blouberg Municipality;

Objective 4: To analyse the waste data generated at the buyback centre and determine how much waste is being recycled through the centre;

Objective 5: To provide solutions to the problems investigated and recommend acceptable practices in rural waste recycling.

1.7 MOTIVATION AND RATIONALE

The study will be building upon on prior research conducted within the P.E.A.C.E Foundation regarding waste recycling in a rural area. This previous research concluded that waste volumes and access to the markets were pivotal in the long-term sustainability of rural recycling projects. However, it was difficult to get the adequate solid waste volumes in a rural area that could sustain a recycling buyback centre. The National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) makes reference to a waste hierarchy, which recommends that before landfilling, other forms of waste handling, including waste recycling, reducing and re-using must be expended to preserve the environment.

This current study has moved from a focus on a rural area to a semi-urban area, where waste generation is higher than in rural areas, and where challenges in waste management are visible. In the location for this study, rampant illegal dumping prevails both within the central business district and around the residential areas. In 2014, illegal dumping in Grahamstown was examined and they found that, where waste management is not properly executed, people engage in illegal dumping, which has an adverse effect on water quality, vegetation and the quality of life of the local people (Ball, Chalmers, Dunywa, Lovelock, Nkata, Pearton, Smart, 2014). Buyback centres can be sustainable solutions as they divert waste from landfills whilst also promoting good waste management practices and saving resources. They can assist in the reduction of illegal dumping and offer a feasible approach to reducing the cost of waste

collection for municipalities, such as the Blouberg Local Municipality, which is struggling to manage their own waste owing to financial constraints.

The impact that such an initiative has, needs to be researched to support the introduction of a culture of recycling in semi urban areas. Buyback centres not only divert waste from landfills, but are also potential poverty alleviation tools that can positively contribute to the further development of semi-urban areas. This research investigates how the recycling centre discussed in this case study will impact on, not only the waste collectors associated with it, but its influence on the broader community of Senwabarwana as well. The results would provide advice for other recycling initiatives to be implemented in semi-urban areas, thereby contributing to the existing body of knowledge and the quality of the environment.

1.8 LIMITATIONS

Through action research, the researcher evaluated the impact of the project that was being rolled out in different phases, while at the same time conducting the research. To this end, timelines and some findings are based on how the project progressed during the research period, implying that the progress of the research was based on the milestones of the project.

No evidence of recorded data on waste trends and volumes in the research area could be readily found. To this extent, data generated by the study does not reflect total waste generated in the area or waste sent to the dumpsite, but that which is captured at the buyback centre and sold to the market. Waste materials, such as glass, are generated on a large scale in the project area, but because these are not traded at the buyback centre, their volumes are not included as part of this research. The gap in knowledge between urban and semi-urban waste management initiatives in South Africa shows that the research may produce results that still need to be tested and further researched in other semi-urban areas to establish best practices. The recommendations presented at the end of this study are acceptable waste management practices.

Another limitation would be that of language barrier, as the researcher is not able to communicate using South Africa's vernacular languages. The researcher made use of an interpreter when conducting the interviews and distributing questionnaires to the waste pickers. To this end, some data may have been lost through interpretation as the questionnaires were all in English and had to be carefully translated to the respondents.

The focus of the research was on the recycling centre and the collectors that are directly involved through collecting and selling of waste. It therefore does not include other collectors

who might be operational in Senwabarwana, therefore the results account for waste recycling through the buyback centre only.

1.9 SEQUENCE OF CHAPTERS

This dissertation consists of five (5) chapters. A summary of each aspect to be covered in the chapters is provided here.

Chapter 1: Introduction

This is an introductory chapter that puts the research topic into context by providing a background of waste management and recycling activities as they are viewed in South Africa. Five objectives are identified that will give structure to the research. The chapter also includes the research problem, motivation, limitations and rationale for choosing the particular topic and objectives.

Chapter 2: Literature review

The background to the study will lead into reviewing relevant literature pertaining to waste management and recycling. This literature is not only confined to South Africa, but also includes case study examples both in Africa and in Europe and other westernised countries. Of particular interest is how different countries have approached, and continue to approach, waste management issues that are addressed in this review of literature. A gap in literature is identified which gives credence to the need for research in recycling and waste management issues within semi-urban areas.

Chapter 3: Case study history and methodology

This chapter focuses on the history of the case study and the methodology used to conduct the research. The history of the case study highlights the milestones at the centre, from the pre-project inception phase to its inception and day to day operations at the time of conducting the research. It also covers the background to the geographic area, its environment in general and relevant statistics which were available. The methodology section looks at the different techniques used to collect data during the research. The research was conducted as an action research procedure making use of both qualitative and quantitative techniques.

Chapter 4: Results and discussion

This covers the presentation of data gathered, the data analysis and the results including discussion on the results. Results are presented in tables, graphs and charts whilst in some instances, the results are presented qualitatively. The analysis is reported according to each objective.

Chapter 5: Summary of findings, recommendations and conclusion

This chapter concludes the study by summarising all the key findings of the study and providing recommendations for further study and for key stakeholders involved in semi-urban waste recycling.

Chapter 2
LITERATURE REVIEW

2.1 INTRODUCTION

This research is centred on the question of how relevant waste management and recycling initiatives and buyback centres are to poverty alleviation and development. The World Bank defines poverty as “a pronounced deprivation in wellbeing which includes low income and an inability to acquire basic goods and services essential for a dignified survival” (World Bank, 2000:15). Aspects to be covered in the literature review include the role of waste pickers in waste management, how buyback centres play a part in waste recovery, different approaches to waste management in developing and developed countries, rural and semi urban waste management and the South African context of waste management including key government policies and their framework. A gap is identified in literature based on the review, indicating the importance of this study to the existing body of research.

2.2 ROLE OF WASTE PICKERS AND BUYBACK CENTRES IN WASTE MANAGEMENT AND RECYCLING

Medina (2008) wrote on the importance of organising waste pickers as informal waste picking was a common way of earning income in many urban areas. In this research, waste pickers are defined as people who collect, sort and sell recyclable waste materials often in an informal capacity (Carras, 2012). Fundamentally, the article identifies three models of organising the waste pickers, namely micro enterprises, cooperatives and public private partnerships. The article strongly brings out the fact that formalisation of waste pickers into these entities often strengthens their ability to do business, also referred to as their bargaining power with government and the industry. This also shows the importance of some form of a business model to ensure sustainability of recycling activities in developing countries. The article further reports that in Brazil and Colombia, waste picker activities are now supported by government, and in Brazil, these activities are now even regarded as occupations (Medina, 2008). A comparison of Brazil’s legal framework with that of South Africa shows that South Africa has gone so far as to realise the importance of recycling, reducing and re-using of waste as opposed to landfilling through the waste hierarchy (DEA, 2011). However, it is yet to integrate informal waste picker activities into the formal waste management framework.

Still on the importance of waste pickers' organising, Wilson, Velis and Cheeseman (2006) identified a hierarchy in the informal recycling sector according to the socio-economic value that each level is able to add to recyclable material. At the bottom of the hierarchy are the individual waste pickers, followed by family units, whilst cooperative and small to medium enterprises follow thereafter. Craftsmen are next on the hierarchy, succeeded by wholesalers and, topping the hierarchy, are the manufacturers (Wilson *et al*., 2006). The level of machinery and activity sophistication, increases within the hierarchy, with baling machines often seen at the small enterprises and cooperatives level (Wilson *et al*., 2006). Value addition[1], which is a way of processing waste to enhance its value, therefore, becomes crucial to the returns and impact these recycling activities have in a particular area.

Considering that the current research is primarily dealing with a cooperative as the direct beneficiaries, who make use of different machinery and mechanisms in enhancing their recyclable materials, the author's view on value addition and on the waste picker hierarchy becomes imperative in this case study. The use of value adding machinery, such as baling machines, assists the cooperative to gain more income as more materials can be sent off to the market. Of importance to value addition is also the possibility of upcycling[2] of waste materials to diversify income streams from waste management. In Belo Horizonte, Brazil, workers transform beer cans and other junk into intricate jewellery, earning about $800 a month from sales (*The Economist*, 2013:34). Such activities may enhance the way waste is managed and in some cases, some waste materials may not have a ready market. If no alternative use exists for these materials, they may end up causing detrimental effects on the environment through pollution caused by the method of disposal.

Solid waste recycling buyback centres play a cardinal role within the waste recycling value chain as they link waste collectors/pickers with waste buyers (Mogotsi, 2008). In a study investigating the viability of establishing solid waste buyback centres within Johannesburg, the positive roles of these buyback centres within the informal sector were highlighted (Mogotsi, 2008). Buyback centres benefit the public fourfold: through provision of income to the entrepreneurs running them; by providing income for waste collectors; through assisting in saving municipal costs for collectors; and lastly, through their role in reducing environmental problems associated with waste disposal to landfill (Mogotsi, 2008). Quantitative surveys were

[1] This includes sorting of waste, cleaning and baling before sending it off to the markets for selling

[2] In this research, upcycling refers to enhancing of waste materials to come up with new products by altering the different waste materials. This does not include reprocessing of the materials, but only looks at changing the form or shape of waste materials to come with a newer product from existing waste materials.

used as part of the methodology, with questionnaires distributed to the selected sample to understand challenges in running buyback centres and gain insight into their operations. Key findings of the study include the need for training and support for those involved within the recycling space, and the need to foster relationships with all stakeholders including government, civil society and the recycling industry. A major assertion based on the results was that the viability of recycling buyback centres is based on economies of scale, brought about by waste volumes that can be processed at these centres (Mogotsi, 2008).

These findings are key in understanding how buyback centres operate within South Africa, and the need to reach ideal waste volumes that can be processed and recycled, depending on specific circumstances. Relevance to this current study becomes clear as the case study under investigation is a buyback centre, though situated in a semi-urban environment.

In a study examining the contribution of waste picking to the livelihoods of waste pickers in Grahamstown, the importance of waste picking to livelihoods of the urban poor was highlighted (Andrews *et al*., 2014). Structured surveys were used on 60 waste pickers, which consisted of 78% males and a majority being within the economically active age bracket of 20-29 years (Andrews *et al*., 2014). The survey established that 70% of the income within the 60 waste pickers was coming from their waste picking activities, though most of the households were poor as they were living on less than $1 a day (Andrews, Chabeli, Earle, Greeves, Lampe,Mabutyana, Nott; 2014). Also, there is exploitation of waste pickers by merchants, particularly with regard to how much merchants pay waste pickers for waste brought in. To this end, the study asserts that there would be need to negotiate waste prices so as to reduce this exploitation (Andrews *et al*., 2014).

What was also highlighted was the low education levels within the surveyed group, which led them to opt for waste picking as a means of sustaining their livelihoods. In the end, the study recommends that the potential of waste picking as a poverty reduction strategy can be enhanced if waste picking is formerly acknowledged and supported through educating the public on the role waste pickers play (Andrews *et al*., 2014). This also resonates with the current study, dealing with waste collectors who sell to merchants and how the buyback centre operates within Senwabarwana.

Waste picking is an alternative for those who cannot find employment in the formal labour force (Fiehn & Ball, 2005), with an estimated 1.6% of households in South Africa having been believed to gain income from selling recyclable materials in 2009 (Viljoen, Schenck & Blaauw, 2012). In a paper investigating the role and linkages of buyback centres in the recycling industry, it was established that buyback centres play an important role in creating formal jobs

and income generation in the informal market (Viljoen *et al*., 2012). Through a mixed methodology of both quantitative and qualitative surveys, Viljoen *et al*. (2012) used several buyback centres in two cities, namely in Pretoria and Bloemfontein as case studies.

A major finding of the study was that there are two sides to recycling, namely with the formal sector that includes Municipalities, NGOs and private waste companies, on the one side, and the informal sector that has kerbside waste pickers and individual waste reclaimers at the landfills, on the other. The two sectors are thus brought together by buyback centres, which cater for both formal and informal job creation. Viljoen *et al*. (2012) assert that it is therefore difficult to separate waste pickers from buyback centres, as the two complement one another through trading in waste, with the centres reaching ideal waste volumes for trading through buying waste from the pickers, and the waste pickers themselves earning a living through selling the waste. This relationship between the buyback centres and waste pickers is, therefore, indicative of the role buyback centres play in helping sustain livelihoods of the waste pickers through buying the waste, making buyback centres a link between the formal and informal waste management sector.

In Egypt, a private voluntary organisation, the Association for the Protection of the Environment (A.P.E), has been able to transform waste picker activities into sustainable economic ventures that created positive social and environmental impacts (Greiss *et al*., 2007). The organisation aims to combine effective waste management and recycling technology with improvements in the standard of living of waste collectors (Greiss *et al*., 2007). The Zabbaleen are the major beneficiaries of this A.P.E initiated project. These people are a minority group in Egypt, who have for years provided a vital service of waste collection for the City of Cairo using donkeys and pickups (Kadduri, 2015). By setting up recycling centres, A.P.E. improved the Zabbaleen's conditions of living and has helped formalise how the Zabbaleen operate in waste management (Greiss *et al*., 2007).

This project has shown that at times, partnerships between waste collectors and other entities, such as non-governmental organisations, are essential for proper waste picker activities, similar to recommendations by Samson (2010). These partnerships are crucial to the long term sustainability of waste management and recycling activities of waste pickers. At the same time, waste collection comes out as one that has a multi-focal approach, with donkeys being used to collect waste and, as is the case of the current study, trolleys and mechanised vehicles also contemplating the collection methods engaged by different waste pickers.

Presenting at the Conference on the business of social and environmental innovation that looks at informal sector entrepreneurship and social entrepreneurship, Touri (2012) highlights

that the informal waste pickers in Bandung, Indonesia, created a market for recycling that operates outside formal solid waste collection. For policy makers to tap into this market, it was essential to have an in-depth understanding of how the waste pickers operate. For his methodology, the author made use of interviews with the waste pickers, middlemen who buy waste from the waste pickers selling it to the end processors (factories), and recycling factories to gather the relevant data (Touri, 2012).

The findings of the study reflect that the middlemen in waste recycling add value and contribute to the efficiency of the supply chain as they provide a market for waste pickers in areas where factories are unwilling to relocate (Touri, 2012). The current recycling centre case study is an example showing a similar trend. Through direct project involvement it has been observed that larger waste processors in Polokwane, or other metropoles, are not willing to collect waste in remote areas due to the distances involved and transport costs they face. In such cases, as is evidenced in this research's study location, collected waste eventually piles up due to a lack of markets. As observed by Touri (2012), the engagement of middlemen and other private sector groups becomes crucial to the success of small-scale informal recycling activities, particularly for the waste collectors. Without these middlemen, waste pickers have difficulty in sustaining their livelihoods, because they will not have a market where they can sell their recyclable materials.

The attitude of the formal waste management sector to informal recycling is often negative, with the former viewing the later as backward, unhygienic and unable to compete in modern waste management systems (Wilson *et al*., 2006). In a paper reviewing the role of informal waste recycling in achieving sustainable waste management in developing countries, it was affirmed by the authors that informal recycling schemes can bring significant socio-economic and health benefits to developing economies. The reliable provision of secondary raw materials within the manufacturing sector points to cost effective processes, as compared to dealing with virgin raw materials (Wilson *et al*., 2006). Furthermore, waste pickers can help cut down municipal costs, through the collection of waste for recycling purposes, which is an option to landfill disposal based on the waste hierarchy.

On the other hand, there are serious occupational health and safety hazards that the pickers are exposed to, which can counter the positive contributions waste pickers bring. Wilson *et al*. (2006) conclude that the best and most effective way to enable waste pickers to operate is through integration of their operations into the formal solid waste management systems in developing worlds. This might be a better option, particularly when looking at semi-urban and some rural areas in developing countries where settlements are widely spaced away from a

central economic hub. Waste pickers can complement municipal efforts, whilst creating employment and reducing the adverse effects of waste disposal to landfills.

Increasing population levels, booming economies, urbanisation and a rise in community standards have accelerated solid waste generation in developing countries (Minghua, Xiumin, Rovetta, Qichang, Vicentini, Bingkai, Giusti, Yi; 2009.). In South Africa, waste generation per capita varies widely depending on income and location (DEAT, 2014) with more waste generated in wealthier areas (usually urban areas) whilst poorer areas (for instance rural communities) produce less waste. In an attempt to qualify and quantify how uncollected waste affected the environment and human health during a 2016 Pikitup strike, a *Checkpoint* episode on E-News Channel Africa (ENCA), brings to the fore the crucial role played by waste pickers in reclaiming uncollected and piling up of waste materials. Whilst those within the formal waste management sector, through Pikitup where on strike and did not provide their waste collection services to the Johannesburg public, the informal waste collectors, through their normal collection activities were collecting recyclable materials which filled up street kerbsides whilst no alternative was provisioned by Pikitup. The livelihood of many poor people in cities depends on collecting recyclable materials on the streets or at disposal sites (Guerrero, Maas, Hoglang, 2013). In this regard, one waste picker interviewed on Checkpoint indicated that he was making R400 a day during the strike period due to high waste volumes owing to non-collection of the waste, when he often would get R150 when there was no strike. What came to light was the economic benefit to the waste pickers, but the environmental aspects and negative impacts to human health are not quantified. The environmental benefits owing to large volumes of recyclable waste materials, which the pickers were able to collect and sell, came out as secondary benefits.

By and large, there is an important role that can be played by waste pickers within the waste management chain. As they collect recyclable waste materials that they can send off to markets to generate income, they can also provide secondary services of diverting waste materials from being landfilled. Though their activities are mainly outside the formal waste management sector, thus implying that they are mostly unregulated, there is an opportunity for them to be a part of how waste is managed in different countries as they offer benefits to both the public and private sector. Buyback centres are also an important link as to how waste pickers operate and it is important that the two parties operate closely together.

A regular sight in South Africa's towns and suburbs are people that push trolleys containing paper, plastic and cardboard that they send off to waste merchants (Mamphitha, 2011). In a study aimed at highlighting and establishing the role of waste pickers in South Africa, it was found that waste merchants regarded waste pickers as value adders within the recycling value

chain, as they diverted and recycled waste that would otherwise end up being landfilled (Mamphitha, 2011). The working definition of waste pickers the study provided was given as men and women who collect discarded materials in streets of suburbs of metropolitan cities, confining waste picking activities in urban areas. Findings from the study also revealed that the main reason why waste pickers opted for their job was because they could not find employment in the formal sector. Through interviews with the waste pickers, it was established that a substantial number had health and safety concerns due to the nature of their jobs. Others also indicated that they were harassed constantly by authorities caused by the fact that their waste collection industry was unregulated and operated informally (Mamphitha, 2011). Others also indicated that, depending on the material they collected, they could earn between R36-R300 daily, with pickers who sold their waste to merchants in Alexandra generally being paid less than those that sold to merchants in Naturena or downtown Johannesburg (Mamphitha, 2011).

2.3 WASTE MANAGEMENT AND RECYCLING IN THE DEVELOPED WORLD

In an episode of *Trashopolis* on Discovery Channel aired on 10th May 2014, it was stated that the average Parisian generates about 1 kilogram of waste per day and of that, about 30% gets recycled, with the rest being incinerated at high cost to the tax payer. The episode gives a historical context of how waste management was transformed in Paris, and how the city has been able to have one of the most efficient waste management systems in the world. It also shows how the rise of capitalism led to increased waste generation and how Napoleon lll (during his reign from 1852 to 1870) was determined to reform Paris through waste management. However, the reforms were at the expense of the 'rag pickers', who were viewed as the hardest working but lowest paid inhabitants of Paris during the rule of Napoleon lll.

These pickers earned a living by scavenging, repairing and recycling whatever they could find at the dumps. They were known to recycle 13% of the city's waste, showing how efficient their activities were. The episode also shows how Paris is recycling today, with drop-off centres and material recovery facilities being set up and separation of waste at source being the major method of waste recovery. What cannot be recycled is incinerated to make energy, though at the expense of the environment. Upcycling is also highlighted as a mode of waste recovery, as picture frames are being made from old tyres and lampshades from waste glass. There is thus a realisation of the importance of the whole recycling value chain and the role of the informal waste pickers and recyclers in this chain. The episode also highlights the gap existing in recycling in the developed and developing countries.

In America, separation of waste at source from the points of generation and material recovery facilities are also some of the ways that waste is managed and recovered (Shirk, 2011). Looking at waste processing, the hierarchy provided by Wilson *et al.* (2006) can also be applied in America and developed countries, as high levels of machinery and sophistication can be seen in these recovery facilities. Shirk (2011) gives an account of a tour of one such facility in San Jose, where waste is processed before being sent off to Asia. What comes out strongly from the article is how differently waste is managed at the facility compared to less developed countries and countries considered being in economic transition, such as South Africa. The lack of markets for waste materials in America gives impetus to exporting the waste to Asia, where there is a ready market (Shirk, 2011). This helps increase the lifespan of landfills in America, as the facility recovers 98% of separated waste and 75% of regular waste (Shirk, 2011). Workers at the recycling facility in America are identified as mainly being male Latinos, with males also dominating the waste industry in third world countries (Shirk, 2011). Noise pollution, air pollution and potential eye injuries are identified as health hazards associated with working in such facilities and with waste in general. Ultimately, it is recommended that waste reduction and not recycling should be dominant owing to the effect and hazards caused on individuals, who deal with waste on a daily basis (Shirk, 2011).

The vastness of Asia sees a mixture of highly developed countries, such as Japan and Singapore, with some of the lesser developed countries in the region, like India and Pakistan (Shekdar, 2009). This is unlike in Europe that has more developed countries and has seen improved waste management, which is essential in making the continent more resource efficient (EU, 2010; EEA, 2013) and makes implementation of environmental and waste policies a priority.

In a publication reviewing milestones in managing solid waste in 32 European countries[3], a pilot project was used. This project was a joint effort between the European Commission (EC) and the European Environment Agency (EEA). Its objective was to enhance efforts to improve knowledge on waste policy implementation (EEA, 2013). Key findings from the review, which covered a period from 2001 to 2010, include the realisation that there was a shift from landfilling to better waste management practices based on the waste hierarchy of disposal. This is so because the number of countries landfilling more than 75% of waste, had decreased (EEA, 2013).

[3] The 27 European Union (EU) countries as of 2013. In addition Croatia, Iceland, Norway, Switzerland and Turkey

Recycling is also common and is widely promoted by regional and local policies, with more and more countries in the European Union (EU) block making substantial progress towards meeting the EU set targets for landfill diversion (European Environment Agency [EEA], 2013). Another key finding was that between 2001 and 2010, the regulatory waste management framework within these European countries promoted waste recycling as opposed to landfilling, because of the different landfill taxes which discouraged landfilling (EEA, 2013). The long-term effect of this recycling saw a reduction in greenhouse gas emissions, further promoting environmental sustainability (EEA, 2013).

Legislation is key to the manner in which solid waste is managed and handled in most European countries, particularly those within the EU. For instance, the EU's Sixth Environment Action Programme (2002-2012) focused on waste prevention and management as one of the four top priorities that would ensure sustainable economic growth (European Union, 2010). With the development of the Thematic Strategy on Waste Prevention and Recycling in 2005, revisions were made to the Waste Framework Directive, which is regarded as the cornerstone of the EU waste policy (EU, 2010). This resulted in recycling targets being set for EU countries, so that 50% of municipal solid waste would be recycled by 2020 and 70% of construction waste to be recycled by the same year, thereby giving credence to the waste hierarchy (EU, 2010). Other regulations within the EU relating to management of waste include the Regulation on Waste Shipment, Packaging and Packing of Waste Directive and the Landfill's Directive, which limit the release of pollutants into the air and underground (EU, 2010).

One example of how effective the legislation at the regional EU level has been implemented would be that of Germany. The responsibility for waste management in Germany is shared between national government, federal states and local authorities, with the EU framework as guideline for implementation (Fischer, 2013b). This has seen the recycling rate of municipal solid waste increasing from 48% in 2001 to 62% in 2010, thereby surpassing the EU target of 50% recycling by 2020 (Fischer, 2013). The introduction of producer responsibility in 1991 has also contributed to an effective waste management system as it places the responsibility of waste from products directly to the producers who have to ensure sound disposal during the products' life cycle (Fischer, 2013). On the other hand, household waste management is placed in the hands of the public and waste disposal authorities as stipulated by the Recycling Management and Waste Act, whilst policies that limit landfilling resulted in 48% of waste being recycled by 2001, way within the EU set target timeframe. In Finland, on the other hand, more effort is required if the country is to meet the recycling target of 50% by 2020 as recycling levels between 2001 and 2010 remained at around 35% (Fischer, 2013a).

There has been a transition within the developed countries, with high recycling and waste recovery rates being dominant, as compared to developing countries that have lower waste recovery rates as will be discussed in sections to follow. For Europe, legislation and policy play a pivotal role in managing waste and from the literature reviewed, legislation is well implemented and enforced, as is seen in Germany. The developed countries have also transitioned from the early formative years when they had waste and rag pickers to a more formalised and sophisticated waste collection framework, which in some instances sees the active participation of citizens in sorting and disposing of recyclable and non-recyclable waste. Other than focusing on the waste after it is discarded, the developed countries have transitioned and now focus on dealing with the waste at source (United Nations Environment Programme [UNEP], 2015).

2.4 WASTE MANAGEMENT IN DEVELOPING COUNTRIES

Rapid growth of cities, particularly in Africa, has led to an increase in waste that is generated owing to the change in human consumption patterns (United Nations Habitat [UN-Habitat], 2014). Poor planning and an absence of or gaps in policy have led to a growth of informal settlements that often lack basic access to waste management services (UN-Habitat, 2014). To exacerbate the waste management challenges, there is a lack in proper landfills in many African countries, which leads to waste being thrown away, often illegally, or dumped in heaps (Simelane, Mohee, 2012). At the same time, quality and availability of data on waste generation and its management in Africa is scantily available, which hampers implementation of developmental programmes (Simelane, Mohee, 2012). This potentially has an adverse environmental and human health impact. Alternatives that include waste separation and recycling need to be explored as they not only provide potential solutions to these problems, but can offer income generation and employment opportunities (Simelane, Mohee, 2012).

In most African countries, authority is vested in the public sector to provide adequate waste management systems, with the private sector also playing a pivotal role (Okot-Okuma, 2012; UN-Habitat, 2014). The waste value chain, including collection, treatment and recycling, often provides economic incentives that allow the private sector to effectively contribute in environmental management (UN-Habitat, 2014). In Nairobi, recycling of inorganic waste comprises of licensed waste dealers, who buy waste from unregistered individual waste pickers and traders and sell it to the waste recyclers (Baud, Post, Furedy, 2004). Additionally, small to medium enterprises in waste management provide employment opportunities in recycling, which makes it essential for them potentially to be considered into the formal waste management industry (UN-Habitat, 2014). Cooperatives, if properly managed, can be

transformed into small to medium enterprises, which directly puts the current case study example into context.

Non-governmental organisations (NGOs) also play an important role in how waste is managed in Africa, particularly in East African countries (Okot-Okuma, 2012). Their role is largely seen in the work they do, particularly with the less privileged urban communities, whilst the waste pickers themselves operate in an unregulated manner, with a potential of becoming more efficient if they consider being regularised (Okot-Okuma, 2012). Therefore, there is a trend of waste picking activities in most African countries, and a centralised point where these waste pickers sell their materials for income generation. These central points can be the recycling buyback centres operated by small enterprises, who gather recyclable waste in large volumes before sending the materials to manufacturers.

A literature review by Samson (2010), aimed at closing the existing literature gap on waste reclamation of re-usable and recyclable materials, provides an in-depth analysis of how waste picker activities are evolving throughout Africa. The paper reflects on ways in which research has been conducted and identifies priorities for future research avenues. Fifty-eight relevant documents were reviewed for the paper, with 19 focusing on South Africa, 13 on Egypt, 5 on Nigeria, 4 from Kenya, 3 from Zimbabwe and 2 from Mozambique (Samson 2010). Of relevance to this study, the paper focuses on the trade of recyclable materials and states that when and where recycling is profitable, there is demand for recyclable materials, and if no demand exists, then waste reclaimers will not prioritise these materials (Samson, 2012). This assertion best explains why there has been a lag in sustainable semi-urban and to an extent rural recycling initiatives and research, owing to low waste volumes in these areas.

Mubaiwa (2006) in his paper, Community based waste management in urban areas*,* gives an account of how some members in three areas in Zimbabwe, specifically Harare, Chitungwiza (a dormitory town outside Harare) and in Epworth (a combination of both formal and informal settlements) were incorporated into Community Based Organisations that focused on waste management (Mubaiwa, 2006). One of the most interesting aspects he brings out in his introduction is how low frequency waste collections in Harare have triggered widespread illegal open dumping and backyard incineration, creating a chain of environmental problems and human health hazards (Mubaiwa, 2006). Statistics show that only 30% of the 2.5 million tonnes of industrial and household waste produced annually is disposed of in regulated landfill sites, threatening environmental and human health as the rest is illegally disposed of (Mubaiwa, 2006).

The paper also shows how a non-governmental organisation was able to intervene and mobilise the communities in these three areas to be proactive in waste management. Baseline studies were conducted to establish the current waste trends and amounts of waste generated in the areas. The communities themselves implemented the appropriate waste management interventions. However, this was also met with resistance by local authorities who were not willing to part with their mandate to provide waste collection services, even though they were failing to do so (Mubaiwa, 2006). There was stigma attached to waste management as a dirty job, and as such, communities did not readily embrace the waste management intervention. Business support culminated in business proposals by the community members themselves. In some cases, as seen in the Epworth case study, the communities signed service provision contracts with the local authorities to collect and dispose of waste (Mubaiwa, 2006), thereby establishing a form of a formalised relationship between the formal public sector and informal sectors. This is similar to one of the recommendations by Samson (2010) regarding the importance of organising of waste pickers, which leads to better coordinated informal waste management activities.

In the 2 November 2013 edition of The Economist, an article titled, Money from rubbish*,* investigates how income generation is possible from waste management. This article focuses on a case study of a cooperative in Pune (India) that was awarded a contract to collect refuse from 400 000 houses. Of significance is how 2300 waste scavengers have been incorporated into the cooperative, thereby benefiting from support services and the collective use of machinery enabling them to earn a dignified living (The Economist, 2013). The cooperative now earns an average of $0.60 per household, and as a result, all members are able to send their children to school from these earnings (The Economist, 2013). Most importantly, the once scavengers are able to keep their profit in the cooperative, enabling them to further grow their business. The many benefits derived from collecting recyclables by the cooperative go beyond scavenging, as this has now turned into a business, servicing the city and giving economic and social outputs in the end. Furthermore, the new guidelines on waste management by the United Nations endorse this approach, as it helps the environment, cuts costs on cities and helps reduce poverty (The Economist, 2013).

In Caracas, Venezuela, each municipality has autonomy on how it disposes waste, and the Sucre Municipality faces challenges when it comes to rolling out efficient waste collection services (Ramos, Vicentini, Ortega 2012). In a study to explore the challenges and opportunities existing in waste collection within the Sucre Municipality, it was ascertained that the collection service at the time was under funded due to the high number of slums within the municipality which rendered the non-payment of waste collection fees (Ramos et al, 2012). Due to the low revenue from fees, municipal workers often went on strike, which would also

lead to pilling up of disposed waste in streets (Ramos et al, 2012). Challenges also existed through lack of adequate resources, which were viewed as not matching demand (Ramos et al, 2012). For instance, the big containers that were provided in some neighbourhood's for waste often filled up within a day, whilst some communities were forced to transport their waste to adjacent neighbourhoods because they did not have these containers (Ramos et al, 2012). Additionally, Venezuela's political and economic instability posed structural challenges to the rolling out of waste collection services as these hindered investment, promoted black market activities and posed operational challenges to waste management contractors (Ramos et al, 2012).

Solutions were being put in place by the Sucre Municipality which are viewed to be assisting to mitigate the waste management challenge. For instance, the municipality is said to have a participatory budgeting process which sees set up community boards allocate funds based on their needs (Ramos et al, 2012). In 2011, it is stated that 2% of the municipality's funds were allocated for waste management and recycling, which the community saw as a crucial area to be looked into (Ramos et al, 2012). Another solution has been provided by waste collectors, known as backpackers who have been able to collect waste daily especially in areas where there are poor road networks (Ramos et al, 2012). These backpackers are opting for waste collection as their second job since most of them are said to be working for the municipality as waste collectors (Ramos et al, 2012). In other areas, for instance, 19 de Abril, these backpackers have formed cooperatives and have received training so that they promote recycling within the community (Ramos et al, 2012). Two setbacks are identified with the cooperative model, namely the outweighing of income by costs which led to less monetary benefits for the cooperatives. The other setback was lack of transportation of waste collected to the market which would help generate income for the cooperative (Ramos et al, 2012), a similar challenge which will also be discussed under the Ndumo case study later in this chapter. In the end, the paper concludes that there was need for Sucre Municipality to invest in recycling as most waste materials generated could either be sold for income or upcycled into new products (Ramos et al, 2012). This the writer asserts would lead to reinvestment of surplus income into poorer communities (Ramos et al, 2012) which shows the potential of the recycling sector within the municipality.

In a paper that analyses solid waste management in Asian countries and plans a possible way forward with regard to managing the waste, it was established that urbanisation in Asian countries has an impact on waste management, as most waste is generated in cities, governed by municipalities (Shekdar, 2009). In the case of China, economic growth and population increase led to rapid urbanisation and a growth in industry in the 1970s, which led to a demand for better public services including waste management (Shekdar, 2009). South

Asian countries on the other hand, due to lower gross domestic product (GDP) have a majority of the people residing in rural areas, which affects composition of their recyclable materials as this is based on economic status (Shekdar, 2009). For instance, Nepal which has a GDP per capita[4] of $1,760, generates between 0.2-0.5kg of waste per capita per day; Vietnam has a GDP of $3,502 per capita and produces 0.55kg of waste per capita per day; whilst Indonesia has a GDP of $5,096 produces waste of between 0.8 to 1kg per capita per day (Shekdar, 2009).

On the other hand, the more developed countries, which have higher GDP, produce more waste per capita per day. These include Hong Kong, with a GDP per capita of $37,385 and generating 2.25kg of waste per capita per day, Japan which produces 1.1kg of waste per capita per day with a GDP of $33,010 and Taiwan which has a GDP of $31,040 and generating 0.667kg of waste per capita per day (Shekdar, 2009). This trend generally strongly supports the argument that recyclable waste generation is influenced by economic status.

With population on the rise and increased urbanisation in developing countries, it is essential to have public services deliver for both the poor and the wider population (Jones, Clench and Harris, 2014). In a study that explored the governance of urban service delivery in developing countries, it was concluded that most literature connected governance, institutional and political economy issues with measurable service delivery outcomes (Jones et al). Through use of principles and elements from evidence focused literature review, 232 sources were used to cover service delivery elements that included transport, social housing, water and sanitation, emergency services and waste management (Jones et al). Of the 232, waste management had the biggest number of sources totalling 51. The literature reviewed showed that coverage and effectiveness of solid waste management varies in developing countries as underfunding of the service is typical and often leads to its ineffectiveness. One of the sources reviewed by the study proved that wealth of a city and its inhabitants were important factors in the delivery of solid waste management in nine cities across Africa and Latin America (Jones et al, 2014). It was also shown that commonly, solid waste management is the responsibility of municipalities which often outsourced the service to appointed contractors (Jones et. al, 2014). In other instances, downward accountability gave citizens an opportunity to influence provision of solid waste management (Jones et. al, 2014), similar to what was shown in the study by Ramos et al (2012). Findings from this review were recommended to be taken as indicative due to the limited body of knowledge on governance and political economy that affect solid waste management (Jones et. al, 2014). In the end, it is concluded that it was difficult to draw comparisons between cities covered in different studies because of

[4] GDP per capita estimated for 2007

differences existing in conceptual approaches to waste management governance (Jones et al, 2014).

2.5 COMPARISON BETWEEN WASTE GENERATED IN DEVELOPED AND DEVELOPING COUNTRIES

Waste collection in rural Asia and lesser developed Asian countries is less mechanised, with carts being the most common method of collection, different from the developed countries that have fixed stations and house to house waste collection systems in place (Shekdar, 2008). Also, waste data recording and capturing within the more developed areas is better than that of the less developed regions. For instance, it is affirmed that reliable waste data is collected and made available to countries, such as Japan, Hong Kong and Singapore, which are regarded as highly developed. This data is then used in waste management planning, whilst in the lesser developed areas, surveys are largely used to capture waste data and these surveys cover a short period of time (Shekdar, 2009). The level of development of these Asian countries also affects the processing and recovery of waste materials.

Developed countries have a stronger public and private sector participation in waste recycling and recovery, with citizens participating actively, whilst in the developing countries, collection and recycling is mainly done by small industries (Shekdar, 2009). China imports waste for recycling and re-use, and has a very strong recycling industry, with over 5000 enterprises that employ 1.4 million people in the collection of steel, paper and glass only (Shekdar, 2009). It can be concluded that in Asia, waste generation, management and recycling vary per country, with the income of the country playing a defining role on the manner in which waste is managed. Indonesia is a lesser developed Asian country where waste collection is mainly done by community units, whilst Japan has transitioned to energy recovery from waste and separation at source (Shekdar, 2009). Low income countries should therefore implement strategies and effective policies that promote waste prevention as their economies grow (United Nations Environment Programme, 2015).

A sharp contrast can be observed between how waste is managed in the developed and developing countries. Developing countries, based on the literature reviewed, are still trying to cope with the effect of development and population increase, especially in urban areas. Unlike developed countries where there has been a shift in the mind-set of how waste is managed, with the separation of waste at the source and waste-to-energy being some of the ways that waste is managed, developing countries are adopting methods of how to deal with waste once it is disposed. Waste management and recycling issues are dominant in Africa because of the

economic and social impact realised by waste pickers, who are able to sell the waste to generate an income.

2.5 WASTE MANAGEMENT IN SOUTH AFRICA

In this research, South Africa's waste management approach will be looked at separately from other developing or African countries, because of its geographic relevance to this study. Historically, South Africa followed an end-of-pipe approach to waste management (Lincoln, 2011). This involves the disposal of waste to landfills as opposed to other means of managing the waste, such as recycling and re-use. This strategy is not sustainable, as some of the waste does not degrade or takes long to do so (Lincoln, 2011). A better strategy of waste management through the waste hierarchy is now being followed in South Africa. This hierarchy encourages waste minimisation and avoidance, as opposed to waste disposal, which should only be done as a last resort.

South Africa's commitment to sustainable development aims to strike a balance between economic and social challenges of an unequal society (DEA, 2012). Economic development, population growth and urbanization have however resulted in increased waste generation requiring implementation of effective waste management policies and programmes (DEA, 2012). This is shown in Chapter 13 of the 2012 edition of South African Environmental Outlook which provides an overview of South Africa's performance with regards to its short and long term responses to changing conditions and assess effects of human interventions and management actions. This report emanates from the 1992 Earth Summit resolution mandating governments to produce such reports in order to disseminate information and data on the environment (DEA, 2012). Impact mapping tool was used in place of scenarios based approach which had been used for previous reports. In Chapter 13 which deals with waste management, benefits of waste management are shown through employment creation, municipal revenue and capital investment all facilitated through the waste sector (DEA, 2012). Employment is created through the labour intensive activities in the recycling sector whilst municipalities can cut on their costs and increase revenue through collection of rates, as evidence by an 8% increase in revenue collected in 2007 and 2008 because of refuse removal (DEA, 2012). Additionally, the report states that capital investment was crucial in order to sustain waste services in South Africa (DEA, 2012).

The 2012 Environment Outlook report also highlights to the legal mandates and responsibilities of the three tiers of government and further points out to South Africa's international obligations in waste management. To mention but a few, these obligations

include the Basel Convention of 1992 which deals with movement of trans-boundary waste, Montreal Protocol of 1989 which looks at phasing out ozone depleting substances and Stockholm Convention of 2004 dealing with organic pollutants (DEA, 2012). This shows that governance is key to how waste is managed in South Africa and all tiers of government have a responsibility to ensure that the legal mandates are followed. The report additionally asserts that the trend in South Africa is that municipalities with bigger populations averagely dispose more waste volumes than smaller municipalities. On the other hand, it also brings out that these smaller municipalities had more landfills, with metropolitan municipalities having an average of 6 landfills but the smaller B3 municipalities with smaller populations averaging 111 landfills (DEA, 2012), possibly due to how the populations are scattered and not concentrated in nature.

A case study is also given in the report which looks at modelling waste collection methods in Mafikeng (DEA, 2012). This case study outlines challenges for municipalities with regards to waste collections and points out to the need to involve other stakeholders which saw the Department of Environmental Affairs partnering with Mafikeng Municipality which saw waste collection being extended to previously unserved rural communities. Funding was provided by the national government and the local government was able to provide technical assistance to the local community through waste collections and waste recycling which was facilitated through separation at source (DEA, 2012). This partnership opened up an opportunity for the community to form recycling cooperatives and small recycling enterprises which not only created employment but also assisted the municipality in waste collection. Even though political and administrative challenges existed, it was concluded that the model has potential to be replicated (DEA, 2012). Parallels can also be drawn with this study's case study as partnership between an NGO and the local government has created jobs and there is potential to replicate the recycling centre in other areas within the municipality.

The July- September 2016 edition of Environment Quarterly puts onto the spotlight different waste management interventions by the Department of Environmental Affairs. Under the tagline 'Turning waste into worth', the publication contains a number of articles dedicated on waste management issues. In one of the articles, the Minister of Environmental Affairs is said to have handed over waste bins in Fort Beaufort in the Eastern Cape so as to raise awareness and educate the community on waste management (DEA, 2016). It is pointed out that this community has serious waste management challenges as evidenced by the amount of litter and illegal dumping (DEA, 2016). Of importance is the role that government is playing in waste management and mitigating effects of improper waste management whilst also bringing benefit to the Eastern Cape communities through job creation in waste (DEA, 2016).

Another article contained in the publication highlights the success brought about by the Department's Working on Waste programme which had created over 13000 jobs in all nine provinces of South Africa (DEA, 2016). The programme aims to address the challenge of increased waste volumes and the backlog in waste collections in urban informal areas, tribal and rural formal settlements (DEA, 2016). It's stated that the programme provides support to communities by providing waste bins, sorting facilities and buyback centres (DEA, 2016). Benefits of the programme include municipal capacity building through provision of waste collection and cleaning, whilst provision of accredited training promotes skills development (DEA, 2016).

A third article in the July-September 2016 edition of Environment Quarterly which is equally relevant to this study focuses on the commissioned waste transfer station in Lepelle Nkumpi Municipality in Limpopo which aimed to create jobs and enhance lives (DEA, 2016). It is stated that the transfer station would bring about efficiency in solid waste collection and also cut on transport costs for the municipality (DEA, 2016). At a community level, it would help create awareness on waste as a financial resource whilst also promoting sustainability by encouraging a culture of recycling as opposed to burning of waste (DEA, 2016). The three articles all show the role that the different tiers of government are playing in promoting good waste management practices in South Africa. They also show how waste recycling is being viewed by government as a potential source of income and job creator in some of the country's municipalities, and how both municipalities and communities can benefit from recycling initiatives.

The Council for Scientific and Industrial Research (CSIR) published their *Municipal waste management: Good practices* document that is aimed at recommending good practices in waste management activities throughout South African Municipalities (CSIR, 2011). They highlight, through case study examples, how a number of municipalities, identified waste management successes through interviews and from the list of cleanest town competitions, are overcoming barriers in waste collection services. Though most of the examples are urban, they offer one example of the Breede River Winelands, an urban municipality with rural outlays, which has developed a bring-in system for waste collection for its rural communities. These communities bring waste to transfer stations and they pay a minimal charge to the municipality bringing the waste in for disposal. The system is effective, as it is a community initiative with the rural community taking initiative to clean their own environment. Challenges in travel distances and road infrastructure tend to inhibit the rolling out of waste collection services in rural areas. The Council reveals that this is why there are no waste collection

services in rural and informal areas. Such an example can be replicated in other Municipalities in South Africa, including the Blouberg Municipality, which is also faced with waste management problems, especially in waste collection.

The *Sowetan* newspaper published an article titled, Dumpsites are now a haven for some (Sowetan, 2013) that highlights the social dynamics at a dumpsite in Rammulotsi in the Freestate Province. Individuals interviewed for this article comments that they mainly scavenged for food and metal that they could sell to the nearby scrap yards (*Sowetan*, 2013:6). On average, it was divulged that selling of scrap material to scrap yards earned those interviewed between R800-R1400 monthly. The scrap yards thus provide a market for these waste pickers at the dumpsite. The main reason why these waste pickers live off the dumpsite is high poverty levels and the lack of employment in the formal sector, as some of those interviewed had never been employed formerly before (Sowetan, 2013). However, the manner in which they conduct their waste picking activities and scavenging for food from the dumpsite, pose serious health risks to these waste pickers. The article highlights what most waste pickers go through on a daily basis. With limited support from government and the private sector entities, waste pickers' working conditions expose them to different health hazards (Wilson *et al*., 2005).

An episode of the television programme, "50/50", aired in 2013 gives context to the waste management challenges faced closer to Senwabarwana, the location for the current study. Part of the episode titled, *Gusts of trash*, focused on the Blouberg Local Municipality's dumpsite in All Days (SABC2, 2013). This is most relevant as the episode focused on the municipality where the case study for this research was done. In the programme, it was shown that All Days, which is in the same municipal area as the research area, was in need of a proper waste dumpsite. Discarded waste was blown around by the wind, causing pollution and potentially affecting the game on nearby farms. It also emerged that no waste processing was taking place in the area and waste was simply being dumped. To a larger extent, this was a reflection of the waste management trends within the Blouberg Municipality, with a 78% waste collection backlog (Blouberg Municipality, 2013). With the initiation of the buyback centre, an opportunity exists to record how the centre impacts on the municipal solid waste disposal system, with a focus on waste collection, sorting and selling.

With talk of the green economy on the South African agenda, there has also been focus on how waste management can contribute to this green economy. In a technical paper focusing on municipal solid waste management in light of its contribution and financial implications to cities moving towards a green economy, the South African Cities Network (SACN) it was stated that the global trend in the waste sector has seen a shift from a collection and disposal

waste hierarchy to one centred on waste minimization and recycling (SACN, 2014). In this regard, the paper asserts that several industrialised countries had adopted policies that have reduced landfilling to below 20%, which is contrary to most African countries which focus more on landfilling (SACN, 2014). However, the paper states that South Africa is doing relatively well compared to other African countries 10% of its waste is being diverted and recycled (SACN, 2014). The paper identified 23 projects in South Africa which are contributing to the green economy. Of the 23, 11 are said to be looking at energy recovery from methane gas in landfills, which are manipulating waste that has not been diverted and recycled (SACN, 2014). In the end, the paper provides recommendations on how the waste sector can contribute to the green economy within the South African context. These include pro-poor policy and planning in waste management strategies to enhance employment and income generation, the strict enforcement of laws to curb illegal dumping, involvement of all stakeholders in waste management strategies including NGOs and promoting public awareness on waste management (SACN, 2014). If these recommendations are executed, the benefits from the waste sector will also assist with extension of landfill sites lifespan and also reduce costs associated with waste management (SACN, 2014). What also comes out strongly is the role played by municipalities in waste management. Additionally, sound implementing models and the need for investment are viewed as key to how the waste sector can contribute to the green economy (SACN, 2014).

2.6 WASTE MANAGEMENT IN SEMI-URBAN AND RURAL AREAS

This study is based on a recycling buyback centre located in a semi-urban area, which is, however, surrounded by predominantly rural outlays consisting of small plots and farms. The proximity to each other of some rural and semi-urban areas, in this case in Senwabarwana, shows there is a shared problem in how waste is managed since the local dumpsite is located in an area considered to be rural. In India, rapid urbanisation has led to waste being generated that is being dumped on neighbouring communities in rural areas, and is seen as a case of social injustice and environmental racism (Nair & Jayakumar, 2008). Rural areas produce their own waste, which is predominantly organic and biodegradable, often having negative effects on the overall sustainability of the ecological balance (Moharana, 2012). However, economic activities outside farming and the transition of some rural economies into semi-urban areas, has seen the increase in non-biodegradable waste, such as paper, plastic and glass in rural communities (Moharana, 2012). Most of this waste is either landfilled or dumped. However, landfilling is not an ideal method of waste management, as it only leads to the postponing of a problem to a later date (Nair & Jayakumar, 2008).

Solid waste management in rural areas tends to be confined to organic waste management owing to farming activities. For instance, in a paper on solid waste management in six villages in Tekanpur, India, it was found that 287gms per capita of agricultural waste was generated in these villages daily, giving leverage to vermicomposting as the best way to manage waste in rural areas (Shah, Sharma & Tiwari, 2012). Though recognition was given to the potential of the selling of recyclable materials to generate an income, their focus was on the usage of organic material more than the inorganic and non-biodegradable. Nair and Jayakumar, (2008), however, asserted that in India still, the general trend has seen villages becoming waste dumping grounds for cities, which then leaves the burden of dealing with non-recyclable waste materials to rural communities. The magnitude of reclaiming waste recyclables might vary depending on their location, but there is need to have an all-encompassing waste management strategy that can address both the composting and the trading in recyclables in rural areas to reduce human and environmental health hazards.

Often the trend in waste management the world over is the transfer of waste management problems from place to place (Nair & Jayakumar, 2008). This is the result of the current waste disposal practices that include waste burning, burying, incinerating and landfilling, which appear to solve the immediate waste problem. However, this poses serious human and environmental problems in the long term (Nair & Jayakumar, 2008). With rural India as a case study, a zero waste system, through the setting up of community based resource centres that serve to utilize discarded material before it is regarded as waste, was proposed. This system proposed is ideal for waste management in rural areas, and has similarly been applied by the P.E.A.C.E Foundation at Ndumo in the past, where waste incineration and recycling were both combined in managing waste in the Ndumo community. However, in the case of Ndumo, this model proved to have its own challenges, some of which will be discussed further in the section below.

There is limited literature reporting on how waste is managed in semi-urban areas, as most literature reviewed is given as either being urban or rural, with no intermediate defined locations. This gap in information provides relevance to the current study, as it will build on literature focusing on how waste is managed in semi-urban areas, which in this study will be defined as areas that have transitioned from being rural owing to their economic activities, but are not well developed to be classified as towns or cities, yet they are urbanised.

2.7 NDUMO PROJECT INITIATED BY P.E.A.C.E FOUNDATION AS A WASTE MANAGEMENT CASE STUDY

The P.E.A.C.E Foundation implemented a waste bring-in centre at Ndumo, a predominantly rural community in northern KwaZulu Natal, mainly as a poverty alleviation initiative for the

community to generate income. This was also the first zero waste scheme that was introduced to the area. The project saw waste being brought in to a central point where volumes would accumulate before being sent through to the buyback centre in Jozini, about 70km away. However, some of the waste was loaded into a drum with a funnel and burnt on site.

Three progress reports (June, August and November 2004) of the project reviewed for this study bring out pertinent issues pertaining to rural waste management. These reports constituted studies by another student who researched the viability of rural waste management programmes through recycling (Progress Report, June 2004). Interviews were then conducted with the different stakeholders involved, including the beneficiaries, government, business community and the P.E.A.C.E Foundation, whilst site visits enabled data collection and validation (Progress Report, June 2004).

The reports highlight critical challenges faced in rural waste management that include access to waste materials, adequate volumes, adequate machinery for value addition and underutilisation of available resources. The August 2004 report mentions that value addition through upcycling of waste to craft was also part of the project, but due to lack of marketing to outside communities, it would not be sustainable in the long-run as an income generating strategy. A gap in the reporting process existed, and most of the waste brought to the centre was either not weighed properly or not recorded for bookkeeping purposes. In this regard, only estimates of the total waste brought to the centre was available, showing only 40% could be recycled, whilst 60% waste was incinerated (Progress Report, August 2004). The volumes of waste generated are given in Table 2.1 below.

***Table 2.1*: Waste volumes at Ndumo Recycling Centre**
(Source: Progress Report, November 2014)

Material	Value (R/kg)	Mass (kg)[5]	Potential income (R)[6]
Food cans	0.15	150	22.50
Glass bottles	0.20	440	88.00
Plastic – Bottles	0.05	100	5.00
– Wrapping	0.05	35	1.75
Cardboard	0.45	100	45.00
Cans – Loose	0.65	10	6.50
– Compacted	0.65	310	201.50
		Total	**370.25**

[5] Masses are approximated on the basis of the collected.
[6] Potential income from recycled waste collected over a period of 14 months (July 2003 – Sep. 2004)

The ratios of recyclable waste volumes against what was burnt on site made the project unsustainable, particularly when looking at the long-term running of the project. The report concludes that without a change in strategy, the project would have to rely on donor funding in order to pay for wages.

Transport of waste was also highlighted as a matter of concern, with long distances involved in waste collections and a lack of transport to move recyclables off to the market in Jozini. For the duration of the three reports that were reviewed, from March-November 2004, not a single sale of waste recyclables had materialised. The lack of association with a bigger recycler (market) would also have a negative impact on the sustainability of the project (Progress Report, August 2004). However, in the report they point out that the project had more impact on the environment through diverting waste materials from being landfilled than on the economic and social aspects, making it a viable environmental initiative.

The November 2004 Progress Report concluded that in order to enhance the sustainability of the project, there was need for an inclusive approach, with the funding partners, government and local business contributing. This would be a way of easing challenges experienced on site and to achieve the objective of a zero waste scheme in a rural setup. Of importance is the contribution from academics, which would help in coming up with an ideal strategy. The findings and recommendations from the reviewed reports become crucial for this current research, regardless of the different locations.

Waste transportation (or lack thereof) by local authorities in rural or semi-urban areas is also a key consideration when looking at waste management in these areas. Waste collection vehicles have insufficient access to rural areas due to adverse road conditions resulting in waste either being illegally dumped in open spaces and drainage systems (Bhagwadin, 2013), or alternatively being burnt as the last resort. An example of Blouberg Municipality can be used, where human and financial constraints have led to challenges in purchasing new equipment to collect waste and bins to dispose of the waste. The result has been a backlog of 55% in waste collections throughout the municipal area (Blouberg Local Municipality, 2015). These human and financial resource constraints have meant the community members have to either dump or burn their waste creating health and environmental hazards that lead to the deterioration of ambient air and water quality (Bhagwadin, 2013).

2.8 LEGISLATIVE FRAMEWORK: LAWS GUIDING WASTE MANAGEMENT IN SOUTH AFRICA

Crucial to understanding the literature guiding waste management and recycling within South Africa is the legislative and policy framework put in place by government authorities. This framework is legally binding and regulates how waste is managed, whilst also pin pointing the corrective mitigation measures required where adverse impacts of waste management and recycling are realised. Particular sections of the legislative framework dealing with environment, waste management and recycling are discussed in the sections below. This legislative framework is applicable within the South African context.

2.8.1 South African Constitution (Act No. 108 of 1996)

In Section 24 of its Bill of Rights, the Constitution addresses environmental rights, as it enshrines these rights to everyone within South Africa. It states that everyone has a right to an environment that is not harmful to their well-being. The sustainable development concept that looks at utilisation of present day resources without compromising the use of the same resources by future generations also comes out. To this end, the constitution states that environmental detrimental activities including those that cause pollution should be prevented, whilst there is to be a balance between the human socio-economic needs with the proper utilisation of natural resources. The Constitution sets the tone for crafting other laws, including those governing the use of the environment and waste management, which will be discussed below.

2.8.2 National Environment Management Act -NEMA (No.107 of 1998)

The Preamble of the Act acknowledges the environmental rights of all and places the responsibility of protecting the social, economic and environmental rights on the State. It further informs that some of the causes of environmentally harmful practices are a direct result of poverty and inequality in the distribution of resources. Chapter 1 of the act looks at principles of environmental management. Some of these principles include prioritising the needs of people first when looking at environmental management and the importance of balancing development with socio-economic and environmental sustainability. The waste management hierarchy also comes out as an important principle to be considered where sustainable development is concerned. This hierarchy looks at a number of ways to manage waste, with the most favourable method of management being waste prevention and the least favourable being waste disposal and landfilling. Though it is further detailed and clearly outlined in the Waste Act, 2008 (Act No. 59 of 2008), the emphasis on waste recycling and recovery is shown in the NEMA.

Other aspects covered by NEMA include institutions and committees responsible for implementing the Act, the need to prepare environmental implementation and management

plans by departments that have an impact on the environment, and the need to remedy any environmental damage by the parties that either damage or pollute the environment.

2.8.3 National Environmental Management: Waste Act , 2008 (Act No. 59 of 2008) NEMWA

This is the main act dealing with waste and its management in South Africa. Its overall purpose is to change the laws regulating the management of waste to protect the health and well-being of the people and environment (Department of Environmental Affairs [DEA], 2011). The preamble of the act, follows on Section 24 of the Constitution, asserting the rights to a clean environment for all in South Africa. Most significantly, it adopts the waste hierarchy as already alluded to earlier under the NEMA heading. This hierarchy is depicted in Figure 2.1.

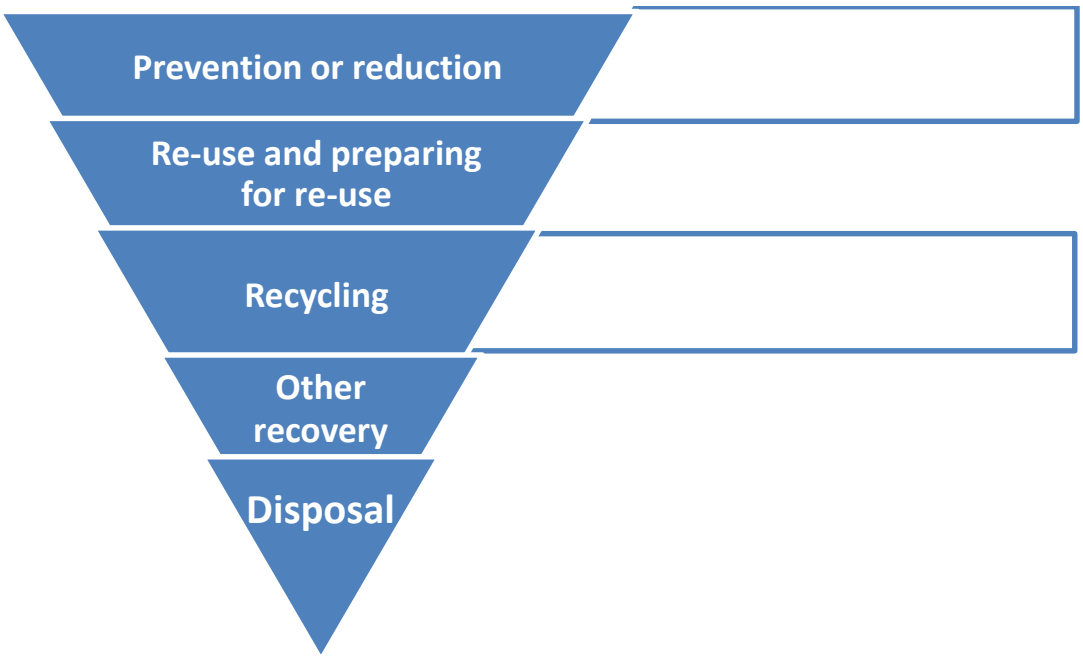


***Figure 2.1*: Waste management hierarchy**
(Department of Science and Technology, 2014)

Chapter 3 of the Act mandates, municipalities had to submit their Integrated Waste Management Plans (IWMP) to the MEC for approval. These plans deal with waste dynamics of a particular municipal area, and how the municipality will mitigate adverse effects caused by waste and how they will manage all waste produced. These plans also form part of the Integrated Development Plan of each municipality. Other aspects covered in the Act include allowing the development of a National Waste Management Strategy, the prioritisation of how waste is managed, licensing issues, management institutions and waste information systems that enable data collection and analysis of waste information.

An amendment to the NEWMA exists as the National Environmental Management Waste Amended Act, 2014 (Act No. 26 of 2014). Of particular interest in this Act is the addition of a pricing strategy. The pricing strategy ensures that fees charged for waste management will, among other things, be used to fund waste re-use, recycling and recovery in previously disadvantaged communities. It, therefore, provides a methodology for setting waste management charges through providing an enabling environment for waste recycling and contributing to the economy (DEA, 2014). The amendment also makes provision for the establishment of a waste management bureau responsible for promoting and facilitating waste minimisation, re-use, recovery and recycling and also monitor the implementation of tools and processes of waste management plans. It also categorises and defines waste, based on waste either being hazardous or general, thereby guiding how the different categories are managed.

Government Gazette 37083 of 2013, which falls under NEMWA, contains amendments to waste management activities listed as having negative effects on the environment. This also deals with the issues of recycling buyback centres. The Gazette deals with three types of waste classified under three categories (A, B and C). Category A deals with general waste, Category B with hazardous waste, whilst scrap metal issues are dealt with in Category C. What is common across all three categories is how they deal with waste re-use, recycling, recovery and treatment. The Gazette stipulates steps required in obtaining a waste licence by individuals dealing in waste, including recycling buyback centres and which individuals require a waste management licence based on how they handle the waste and how large the space is that they operate from (RSA, 2013).

2.8.4 Health Act , 1977 (Act No. 63 of 1977)

This piece of legislation was enacted to provide measures that promote the health of the inhabitants of South Africa. Its main purpose is to define duties and regulate health services within the Republic and coordinate health issues. Of importance to waste management issues is Section 38, which addresses regulations relating to general waste, sewage and other forms of waste. If not properly managed, waste has the potential to pose a hazard to human health, and this Act regulates the mitigation of pollution that can be detrimental to human health.

2.8.5 Municipal Systems Act, 2000 (Act No. 32 of 2000)

The Municipal Systems Act requires municipalities to undertake developmentally focused planning in line with local government requirements and duties as prescribed in Sections 152 and 153 of the Constitution (Blouberg Local Municipality, 2013). It also requires that municipalities draft and adopt, after approval, an Integrated Development Plan (IDP) through the municipal council. The IDP itself highlights developmental areas for consideration by each

municipality, and allocates resources to match these developments. Of significance, the plan also identifies communities that do not have access to basic municipal services, including waste management, and maps out plans on how to extend the different services to these areas.

2.8.6 Polokwane Declaration on Waste Management of 2001

This declaration was made in 2001 at the first National Waste Summit hosted by the then Department of Environmental Affairs and Tourism in Polokwane. It prioritised waste management and, in particular, the importance to reduce, recover, re-use and recycle waste in South Africa. A commitment was made at the Summit to achieve 50% in reducing waste generation and landfilling by 2012, whilst working on a zero waste plan to be achieved by 2022. The relationship between waste management and sustainable development was key in the drafting of the Declaration, having been recognised within the vision as pivotal in improving the quality of life. Of greater importance is the recognition of the importance of an all-inclusive approach to waste management, with government, private sector, communities and the civil sector all having to play a part in order to attain the goals set in the Declaration.

In relation to the legislative framework, it can be asserted that an ideal legislative framework exists for how waste is managed in South Africa. The NEMA and the amendments to NEMWA show that there has been an effort to regulate how waste is managed and, to a lesser extent, how buyback centres are run. However, what is not made clear is the contribution to waste management by informal waste pickers (Polokwane Declaration on Waste Management, 2001).

2.9 CONCLUSION

Based on these observations, a dearth in the literature, with a particular focus on semi-urban waste management and recycling, exists in South Africa. The literature reviewed proved to be valuable in understanding waste management trends globally and nationally in South Africa as well. However, much of the literature is focused mainly on urban communities and how waste is managed in semi-urban areas has not been researched and documented extensively. This gap offers an ideal opportunity to research the potential of recycling waste in semi-urban areas which have outlaying rural areas, such as Senwabarwana. With the Ndumo case study as a basis, there is an opportunity to research waste management in Senwabarwana further. Results and observations of the two case studies can be compared and could provide a guideline for further research.

Chapter 3
CASE STUDY BACKGROUND AND METHODOLOGY

3.1 INTRODUCTION

This chapter has two focus areas. It firstly looks at the case study background, primarily the level of functionality of the recycling centre during the time of conducting fieldwork. The first focus is devoted to the background of Senwabarwana, the location serving as the case study regarding how and where the Recycling Buyback Centre is situated in relation to its direct environment. The second focus is on the methodology and research design used during the study.

3.2 BACKGROUND OF CASE STUDY

The P.E.A.C.E Foundation planned the case study project since 2012 and initiated it at the end of January 2014. The project entails a recycling buyback centre, which facilitates the collection, sorting and selling of waste in the semi-urban community of Senwabarwana in the Limpopo Province. The Foundation has a role of overseeing the project implementation, marketing, fundraising and general management of the Centre. However, it does not receive any financial benefit from the Centre, as this was set up to benefit the community directly. The Blouberg Municipality is also a stakeholder in the project, being the overall authority responsible for development within the area. The project is run by a registered cooperative of five women, the Thinana Waste Management and Recycling Cooperative, who have been registered since 2009. Additional collectors on foot (using trolleys) and donkey carts also work at the Centre as casual waste collectors. Prior to being involved at the recycling centre, the cooperative operated from the Senwabarwana dumpsite with no protective clothing and little access to the market. They therefore could not generate an income from their operations, as they could not access the recycling market. The P.E.A.C.E. Foundation provided the following for the cooperative through different fundraising avenues;

- Provision of a 1.6 hectare plot to operate from on a 10-year lease basis;
- Water provision (through a borehole connection);
- Three phase electrical connection and solar system;
- Office and sorting space (fully renovated and secured);
- Security fencing and gates;

- Baling machine, electronic weighing scale, protective clothing and five waste collection trolleys;
- Donkey carts;
- Marketing services, business planning and business negotiations;
- Financial assistance and mentorship;

The land itself is a 1.6HA plot, which is isolated from the nearby shops, schools and residential areas but close enough to be able to service waste that is generated in these areas. Only a section of the whole plot (about 1/3 of total plot) is currently being used for the recycling activities, mainly the physical building on site (housing the sorting area, administrative area and ablution facilities), and approximately a 100m2 portion where some of the waste is stored.

3.2.1 Waste collection process and duties at the Centre

The need for planning in the waste recycling business is based on some of the challenges the beneficiary cooperative faced since 2009. The initiation of the project was based on donor funding and non-repayable grants from a number of local and foreign donors until the recycling centre was completed. All waste collectors (respondents in this study) and the cooperative are involved in collecting waste. Sources of the waste are listed below:

- Senwabarwana dumpsite, which is the main source of recyclable materials;
- Municipality offices and other government departments;
- Boxer shop at Bochum Plaza;
- Illegal dumping spots within Senwabarwana town and residential areas;
- Adjacent villages, usually within an 8-km radius from the Centre.

All waste collectors bring in their materials sorted, and in cases where they have not sorted, they do so at the recycling centre. The cooperative and centre manager ensure that all waste is stored accordingly and verify that all waste has been sorted as stipulated (quality control). The cooperative is responsible for sorting the materials they bring through. Before being stored, all waste is weighed using an electronic scale, and the volumes are recorded and invoiced by the centre manager, who eventually records them electronically onto an excel spreadsheet. Material is also baled using a manual baling machine. Selling of the waste is usually prearranged with the buyers who travel from Polokwane to Senwabarwana and do a round trip that is approximately 200km.

Once the buyers pay the cooperative for waste brought in, the centre manager authorises payments electronically to all individual collectors. The collectors are paid per kilogramme of waste based on the type and amount of waste they bring in and guided by a pricing structure, whilst the cooperative are paid a predetermined R600 monthly wage. The centre manager is

paid directly by the P.E.A.C.E. Foundation. Waste materials collected, baled and stored for selling purposes include paper, plastic and cans and a pricing structure is in place which caters for the buying in and selling out of the different waste materials. The pricing structure at the time of conducting the study is shown in Table 3.1.

***Table 3.1*: Pricing structure of waste materials at the Centre**

(Source: Recycling Centre Pricing List on site)

Recyclable	Buying price/kg	Selling price/kg
Cardboard	R0.20	R 0.40
White paper	R0.60	R 1.00
PET (Polyethylene Terephthalate)	R0.80	R 1.50
HDPE	R0.70	R 1.30
LDPE	R0.70	R 1.30
LDPE stretch (Wrap plastics)	R0.60	R 1.00
LDPE mix (mixed plastics)	R0.50	R 0.80
CMW (common mixed waste)	–	R 0.10
Steel cans	R0.30	R0.50
Aluminium cans	R2	R4

HDPE = High Density Polyethylene LDPE = Low Density Polyethylene

Glass has however been excluded from being traded at the buyback centre as it is labour intensive both in the collection and sorting (crushing) and fetches the lowest price on the market. The waste management trends and opportunities in Senwabarwana, including the interventions brought about by the recycling centre and the role played by the different parties involved directly at the Centre is summarised in Figure 3.1.

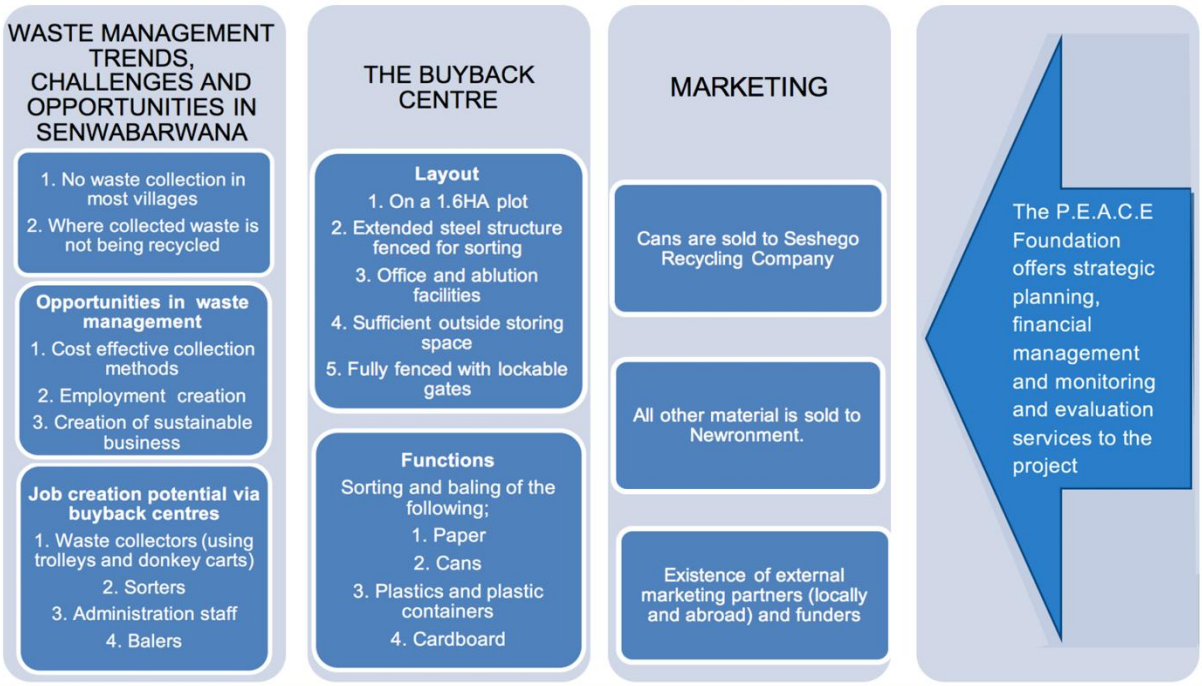
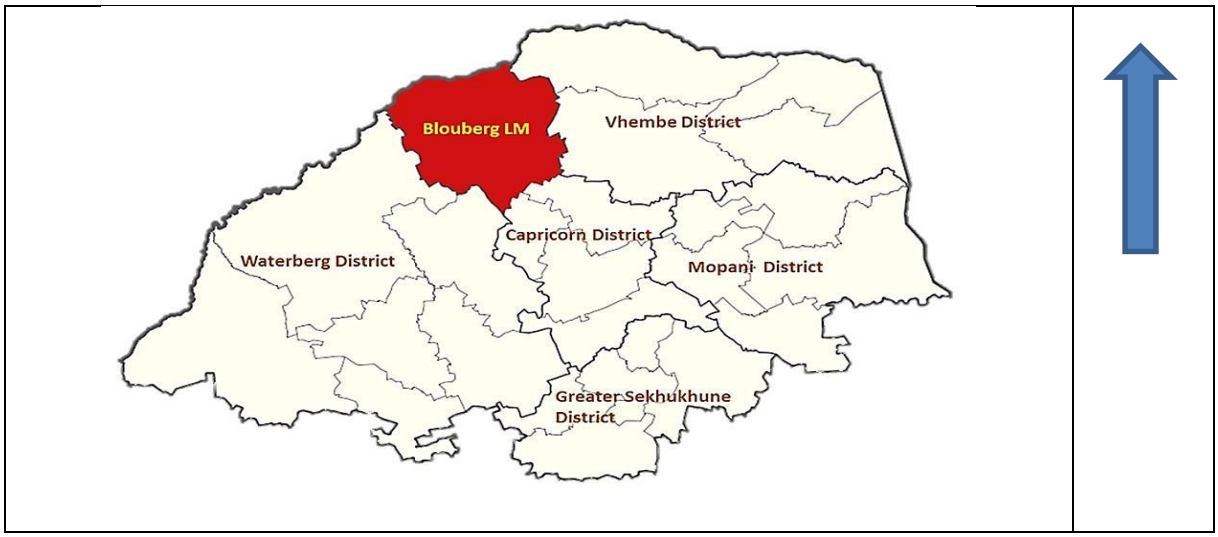


***Figure 3.1*: Recycling Buyback Centre Model**
(Source: Own drawing based on personal assessment)

3.3 STUDY LOCATION: SENWABARWANA, BLOUBERG MUNICIPALITY, LIMPOPO

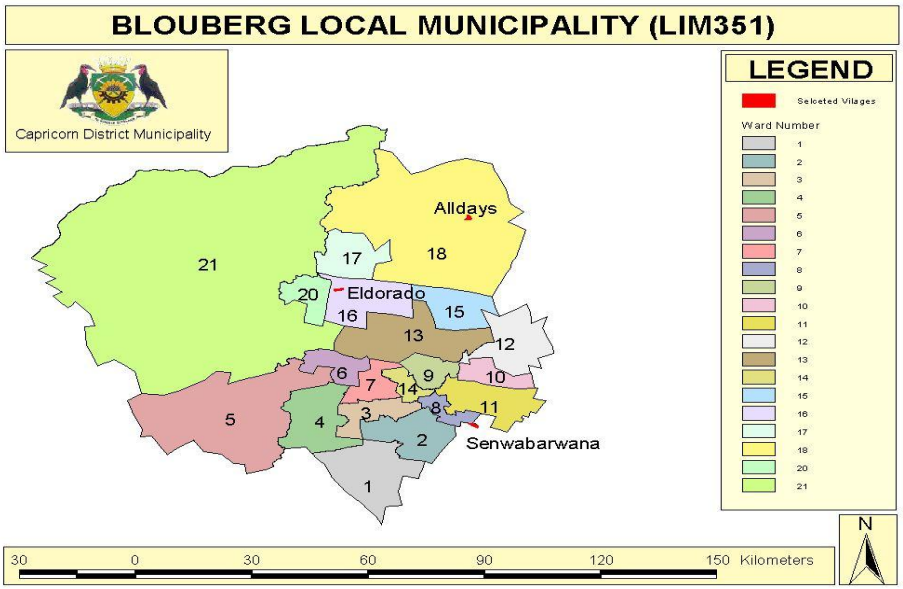
The local Blouberg Municipality is situated towards the far northern part of the Capricorn District in the Limpopo Province, bordered by Aganang to the south, Molemole to the south-west, Makhado to the north-east, Lephalale to the north-west, with Mogalakwena to the south-west and Musina to the north. As per the Demarcations Board report of 2011, the municipality covers an area of about 9,248.44km^2 including the newly incorporated areas (Blouberg Municipality, 2013). The Blouberg Municipality has a total population of 166 825, with an unemployment rate of 39.2% and a weekly refuse collection of 20.7% (Statistics SA, 2011). The percentage of female headed households in the whole municipality is estimated at 56.3% (Statistics SA, 2011), which, to a lesser degree, might explain why there are more females than males, some of which are the breadwinners in their households. Senwabarwana has a population of 6777, with 2445 households and a refuse collection rate of 43.5% (Statistics SA, 2011). The refuse collection rate is high, due to the fact that there is a daily waste collection service for the area. Map 3.1 shows the Blouberg Local Municipality in relation to other local Municipalities in Limpopo.



Map 3.1: **Location of Blouberg Municipality**
(Source: Blouberg Municipality Draft Integrated Waste Management Plan, 2013:12)

The municipality is largely rural with 99,8% of its settlements being under traditional leadership. Stats SA, 2011). As of 2011, the population of the whole municipality was 162 629 and the population was broken down to 39% young (under 14 years), 53,7% being regarded as the working age and 7,3% being regarded as elderly (Stats SA, 2011). The municipality has challenges with employment, with the unemployment rate sitting at 39,2% in 2011, with a high youth unemployment rate of 47,2% (Stats SA, 2011). The above scenario therefore shows a youth that are not able to contribute fully to developing the area as few job opportunities exist.

The research will however be confined to Senwabarwana, which is the administrative head office for the Municipality and is regarded as semi-urban, serving as a base for many government services, including the hospital. It is estimated that Senwabarwana has 48,5% female headed households, which may also explain why the case study has more female participants as opposed to males. Senwabarwana is where the Recycling Buy Back Centre is situated. The recycling initiatives conducted by P.E.A.C.E will be carried out there as it has the highest volumes of waste generation. A dumpsite exists which is used currently and a new landfill site (not yet in use) is yet to be licensed. Wards surrounding Senwabarwana will be used as satellite waste collection points, which will be linked directly to the recycling centre. These wards are shown in Map 3.2. By means of Google Earth (Figure 3.3), the actual location of the recycling centre in relation to the residential and commercial areas of Senwabarwana is depicted.



Map 3.2: **Wards within Blouberg Local Municipality**
(Source: Blouberg Municipality Integrated Development Plan, 2011:5)

1= Dumpsite 2= Residential area 3= Recycling Centre 4= Residential Area 5= Residential Area
6= Hellena Franz Hospital 7= Industrial area 8= Commercial area

Map 3.3: **Actual location of buyback centre in Senwabarwana** (Source: Google Earth)

3.4 METHODOLOGY

3.4.1 Research design

This study takes an action research approach and also makes use of the buyback centre as a case study. According to Ferrance (2000), action research is a reflective process that caters for both inquiry and discussion within the research. Rather than just focusing on theory, action research enables researchers to address issues directly affecting them, enabling researchers to exhibit influence over these issues and bring about change (Ferrance, 2000). Key to action research is how to improve programmes, techniques and strategies (Ferrance, 2000).

It is noted that the researcher is directly involved with the case study buyback centre, responsible for its overall management and implementation (from its inception) within the P.E.A.C.E. Foundation. His role with the case study therefore influenced him to delve into this research so as to incorporate lessons from the shortcomings at Ndumo whilst also assisting to reflect and improve on how the organisation replicates similar recycling facilities. The contribution through action research therefore goes beyond contributing to the existing body of knowledge, but also translates into results that can be practically used in day-to-day programmes (Ferrance, 2000), in this case, within the P.E.A.C.E. methodology of poverty alleviation. With the Ndumo study as a basis, the current study builds on the results and challenges identified at Ndumo, thereby improving the strategy used in Ndumo, and also building on the theoretical body of knowledge regarding semi-urban informal waste recycling.

Though the research was largely qualitative, a mixed method approach was used to cater for both qualitative and quantitative techniques, as this allows for maximum collection of data (Viljoen *et al*., 2012). The structured questionnaire used enabled the collection of qualitative data as it looked into how much the respondents were affected by their involvement with the recycling centre. Where additional data was required, focus group discussions and direct interviews were used.

Since data regarding waste volumes in Senwabarwana was not available, quantitative techniques were used mainly for the fourth objective, which assessed waste volumes recovered and processed at the recycling centre. Convenience sampling was used since only those who sold waste directly at the centre completed the questionnaire. Considering that this research will add to the existing body of knowledge and would also apply planning and improvement of semi-urban informal waste recycling, both qualitative and quantitative methods elicit a balance and relevance to the research, whilst the sampling method allowed the research to have a core sample relevant to the study.

3.4.2 Motivation for selection of literature

The literature review formed part of the methodology so as to understand what has been researched before and find the gaps in the literature where research is needed, thereby revealing the relevance of this current research. Mogosti (2008) in his literature review, covered such issues as the history of buyback centres, the legislation and trends in recycling, whilst conducting research on the viability of recycling buyback centres in the city of Johannesburg. Similarly, the literature reviewed in this study covers legislation and recycling trends in developing and developed countries. Furthermore, the literature review also covered semi-urban and rural waste management trends, with a review of three reports on the Ndumo case study, which is relevant and central to the current research. Different documents and literature from a variety of sources were used, where a laptop and the Internet served as the major tools in reviewing the literature. However, the biggest limitation to the literature reviewed was very few actually covered buyback centres, with most of the literature mainly focusing on waste collectors, and not necessarily the centres where they sell that waste to.

3.4.3 Primary data collection

3.4.3.1 Distribution of questionnaires and focus-group discussion

Questionnaires (Annexure) were the main data collection tools used. These were distributed to all groups that are involved with collecting and sorting waste at the recycling centre, including the centre manager responsible for managing the day-to-day operations of the Centre. The total number of respondents was 14. Thus, convenience sampling were used, targeting only those collectors who were directly linked to the case study. To this end, 100% sampling was done, as all 14 respondents were the ones directly involved and working at the recycling centre. Though this type of sampling is regarded as potentially yielding poor quality data (Marshall, 1996), this was the most appropriate considering that the research focused on a small group of collectors, directly associated with the case study. The sample also consisted of different groups at the Centre (cooperative, collectors and centre manager) who are affected differently by their operations at the buyback centre.

The questionnaire was designed to partially adopt the format of a social impact reporting tool, a standard form of measuring social impact within the P.E.A.C.E Foundation projects. Some of the aspects of the questionnaire were not tested for the study, as they were unsuitable for the current study. Within the tool, the portion under Case Study Overview shows the different stakeholders involved with the case study and what their roles and responsibilities are. It also served as a guide during the formulation of the questionnaire, as it shows the types of questions to be asked for each respondent group and shows whether the questions to be asked are qualitative or quantitative. It has been included as part of the questionnaire so as to give an overview and background to the project and job structure, and will not be applied for this study.

The other section of the data collected generally summarises the wages of both collectors and the cooperative, and also quantifies waste over different periods during the study. It serves only as a summary of study data. The most relevant tool used was the questionnaire, which was administered to the different respondent groups/individuals at the Centre and involved all at the Centre. This was done through an interpreter who was conversant with the local vernacular, a skill the researcher lacked. Follow-up data collection techniques with the collectors were done mainly through focus group discussions. The stakeholders identified at the Centre for the questionnaires were grouped into:

- Recycling cooperative (5 respondents);
- Waste collectors on foot (4 respondents);
- Waste collectors using donkeys (4 respondents); and
- Management/Centre Manager (1 respondent)

It was necessary to distribute the questionnaire separately per group, and also individually so as to identify how the different groups of waste collectors are benefiting from the recycling centre. The respondents were also interviewed separately based on at what point they got involved with the project, since not all of them were part of the project from the start. When the Centre came into being, only Thinana Cooperative were involved, and these were the first to have the questionnaire administered to them. This group was followed by the Collectors on foot, who were recruited after that, whilst the Collectors using donkeys were recruited last and hence their responses were recorded separately. The Centre Manager was only interviewed after she was given a permanent contract to work at the Centre. In this regard, the questionnaire provides responses from the different groups operational at the Centre and were captured per group rather than altogether. However, all the economic, social and environmental impacts of the Centre were covered in the questionnaire.

Using 100% of the sample drawn from those directly involved with the buyback centre, it had been planned to administer the questionnaire at least after six months into the Centre being operational, and thereafter re-administer the questionnaire for a second time. The initial distribution was done six months after the initiation of the research. However, owing to some operational challenges observed at the Centre and to limited change in income trends, it was not possible to distribute the questionnaire every three months, but was replaced by group discussions. A section of the questionnaire also had a practical exercise where ten small stones were used in responding to a particular question on how income was allocated in the households of the respondents.

3.4.3.2 Interviews

Convenience sampling was also used in conducting interviews for this study. These interviews were informal and included telephonic interviews and face-to-face interviews depending on the circumstances. These interviews were mostly done with people within the Municipality, recycling industry (PETCO) and support agencies. They were conducted in order to investigate problems that were faced in rolling out recycling projects in general. Topics were given to the interviewees from PETCO and the Limpopo Economic Development Agency (LEDA) in order to ascertain what, in their own opinion, were challenges faced by cooperatives and those in the recycling industry. The interviewees were afforded the opportunity to give their input as points which they would expand on and discuss throughout the interview. The interview with PETCO was a face-to-face interview conducted in Pretoria.

The selection of the interviewees was based on the most relevant person recommended by the interviewed organisation and understood to be best positioned to assist with responses to the questions. PETCO was selected as it is an organisation that works closely with recycling cooperatives and enterprises in South Africa. The Limpopo Economic Development Agency was selected because they registered the recycling cooperative at the buyback centre and they register and support cooperatives within Limpopo. The involvement in this study of the Blouberg Municipality was due to the fact that they are the overall local authority within the study area, and they would provide information key to assessing the framework within the context of waste management and recycling.

The owners of the businesses who bought waste from the recycling centre were also interviewed as their input would be most relevant, since they buy from smaller waste collectors within and outside Polokwane. These owners were asked what kind of challenges they face or believed people in the recycling industry faced particularly when dealing with smaller entities in semi-urban or rural areas. Their informed opinion based on their own experiences became relevant, and in this regard, no other waste buyers were used for this study. Owing to the geographic location of the project, in some instances, telephonic interviews were the most convenient form of data collection. Technology was used through email correspondence mainly to schedule the telephonic interviews with the respective parties.

3.4.4 Secondary data for validation and background

The use of secondary data included the two most relevant documents for assessing the municipal framework on waste management issues. These documents were namely the master plan of the Integrated Development Plan and the draft on Integrated Waste Management. As noted by Fiehn & Ball (2005), information on waste generation is not readily available owing to the unavailability of waste information systems at local municipalities. Additionally, few studies to date have been able to cover topics on buyback centres. To this

extent, the secondary data used also include waste information generated at the recycling centre, which was captured through a Microsoft Excel spreadsheet. Daily waste data is captured by the Centre Manager using both manual and electronic means. The manual data is recorded in a book while electronically, a Microsoft Excel spreadsheet is compiled through the use of a laptop computer. Manual recording is usually for back-up purposes. The electronic versions of the records are updated daily and shared by the Centre Manager via Dropbox. For the purposes of this study, an analysis will be given based on two aspects of the project.

- Through scrutiny of the waste volumes captured at the recycling centre quarterly from the first week recorded on the operation's spreadsheet. This shows the waste trends generated at the Centre. Through random sampling, four quarterly data of waste volumes was analysed to see the volume trends over different months.
- By comparing the waste collected by the different operational groups at the recycling centre, namely the recycling cooperative, the group of collectors with trolleys and the donkey cart owners.

3.4.5 Personal experiences and analysis

With action research as framework, personal experiences are valid as they provide an insight that is specific to the recycling centre. Instances where these direct experiences are used include observations of the environmental impact of the recycling centre, through the use of photographs, and where recommendations and solutions to some of the identified problems are given.

3.5 CONCLUDING COMMENT

The methodology used provided a framework to conducting this study. As discussed, the selection of the different methodologies were due to a number of factors including personal involvement in the project and the beneficiaries at the recycling centre, making the methodology specific to the current study. The next chapter, Chapter 4, gives the results and analysis of the findings from this study, based on the research methodology discussed in this chapter.

Chapter 4
RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter reports on how the five objectives were met during the study. With exception of the fifth objective, each objective will be introduced, and thereafter the findings from the field work will be given, whilst the analysis of outcomes follows at the end of each objective. Objective 5 looking at providing solutions to some problems identified and proposing acceptable practices in semi-urban waste recycling will follow in a different format.

4.2 OBJECTIVE 1: Sustainability of recycling centre

The sustainability of the centre covers the social, economic and environmental impacts of the buyback centre in Senwabarwana. With reference to the questionnaire, the social aspects include the general background of each respondent, skills and training, nature of jobs they did prior to joining the Centre and how they view their current working conditions. The economic aspects cover all issues that have to do with income generation and allocation, whilst the environmental aspects will look at how the respondents view the Centre as impacting on the environment and community.

4.2.1 Social impact

4.2.1.1 Household sizes and earning income

The first aspect covered by the questionnaire was to establish the household sizes of each respondent's family, and then establish how many people within the household have a regular income. Figure 4.1 to follow, summarises the findings from the respondents.

The households ranged between 1 and 12, with an average household size of seven. This shows a relatively large household size for most of the respondents, considering that of the 14 respondents, only three (3) indicated that two people in their households, including them, were earning an income. The remaining 11 indicated that only they were earning an income, which they were earning through the recycling centre. This puts into context the benefits of the recycling centre to the respondents, as it shows that income being received by most respondents is the only income source in their households, which is not only sustaining them but their families as well, regardless of the family size.

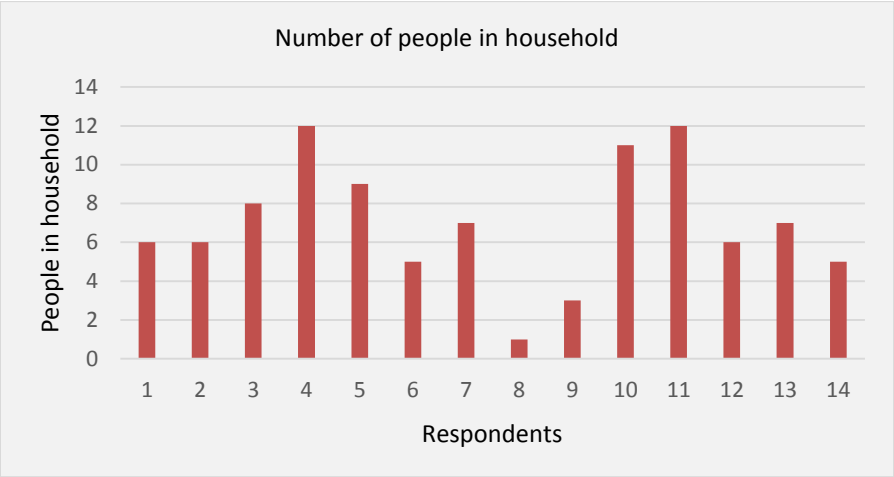


***Figure 4.1*: Household sizes and earning income**

(Source: Personal analysis)

4.2.1.2 How long have you been working for the cooperative?

This question was asked in order to determine the time frames that all those interviewed have worked at the recycling centre in order to understand the general background of all respondents.

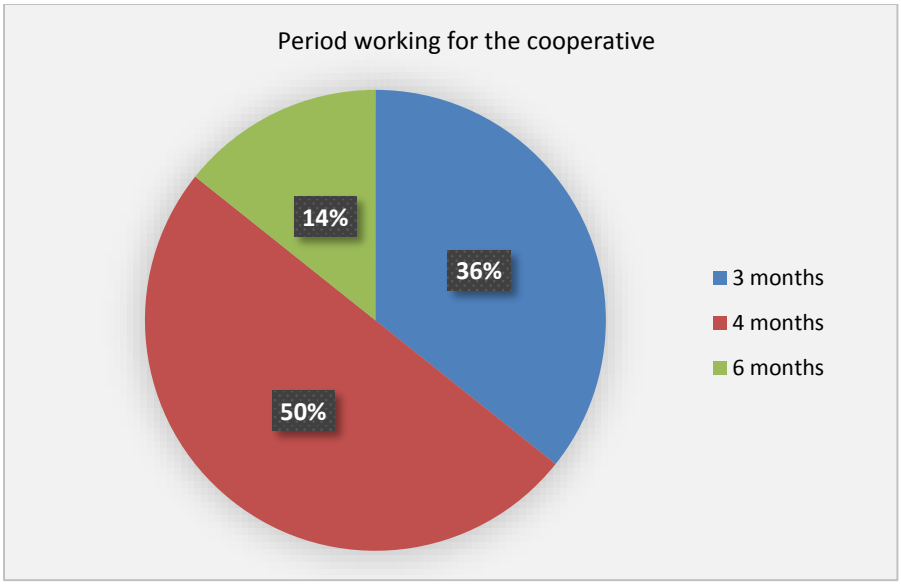


***Figure 4.2*: Period working for cooperative**

(Source: Personal Analysis)

Half (50%) of the respondents indicated that they had been with the cooperative for four months, whilst 36% had been with the cooperative for three months (Figure 4.2). The remaining 14% indicated that they had been with the cooperative for six months. As mentioned, the questionnaire was administered after a minimum of three months that each respondent had been at the centre. Therefore, 86% of the respondents were relatively new at the centre, having

worked there for less than six months. It should be emphasised that the first group to be interviewed were the recycling cooperative, followed by their collectors on foot and lastly the collectors using donkey carts.

4.2.1.3 Have you ever received training in conducting recycling activities?

This question concerned whether the collectors had received any training in waste recycling issues, so as to understand from where they acquired their knowledge in recycling.

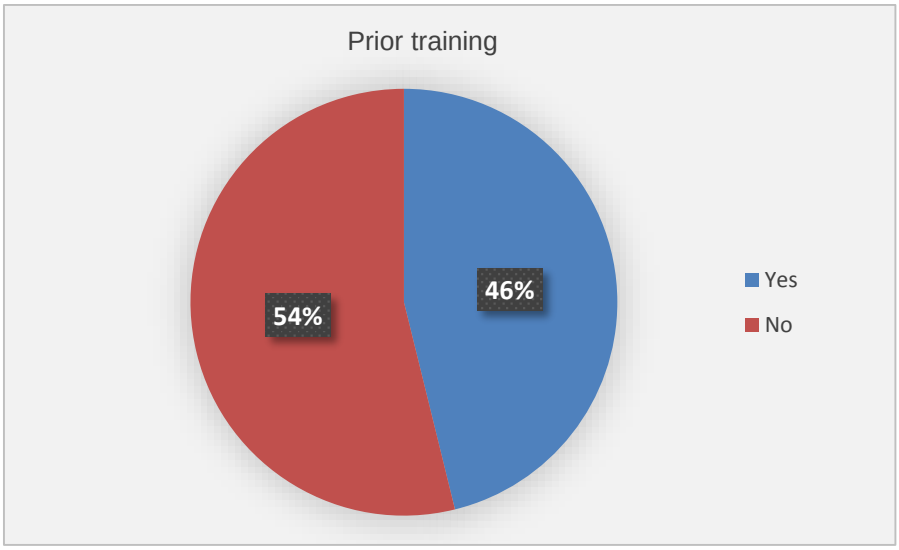


***Figure 4.3*: Prior training in recycling**

(Source: Personal Analysis)

Thirteen (13) of the respondents directly involved in waste collection were asked whether they had received prior training in waste recycling. As shown in Figure 4.3, six (6) respondents indicated they had received some form of training whilst seven (7) indicated they had not received training. Those who had received training include the cooperative who had been trained by Anti Waste and one donkey owner who had been trained by Donkey Power (both third party organisations whose services had been outsourced). Those who had not been trained formally indicated that they got training from other cooperative members. This shows a positive social impact through skills transfer as the cooperative was able to mentor other collectors into waste recycling.

4.2.1.4 Would you need more training on some special issue(s)?

As depicted in Figure 4.4, two (2) respondents indicated that they would not be needing further training, while one chose “Yes” thus they would be requiring more training. The majority (10 respondents) indicated they would be requiring a lot of further training, which is reasonable since most of them only learnt of recycling through the cooperative members and have never had formal training, unlike the cooperatives themselves. Identifying the areas for further

training was not tested for this study, but the need for more training on recycling issues was shown to be required.

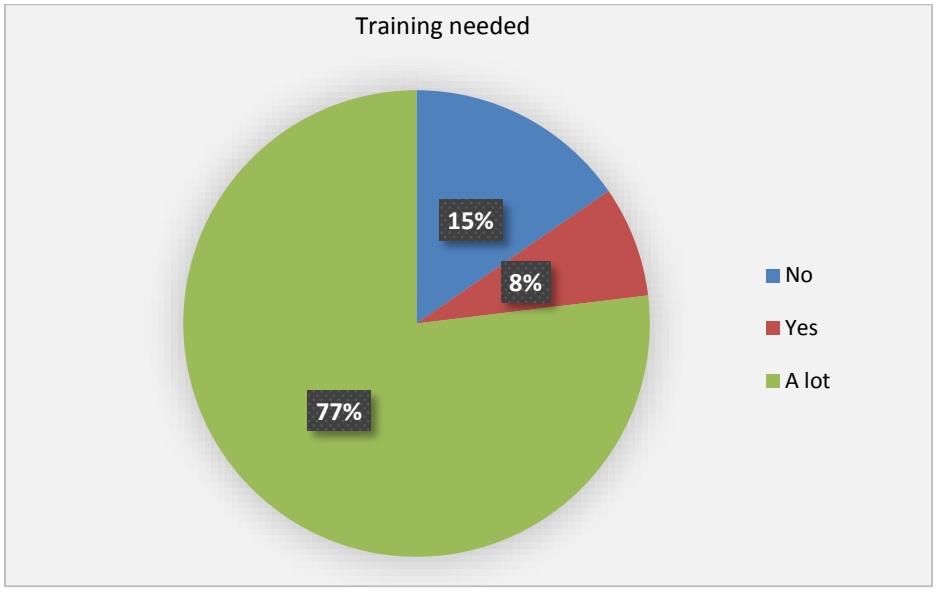


***Figure 4.4*: Need for further training**

(Source: Personal Analysis)

4.2.1.5 What was your previous employment before joining the cooperative?

Regarding their previous employment opportunities, 36% indicated that they were waste collectors before joining the recycling centre (Figure 4.5). Nearly a third (29%) were previously unemployed and the Centre offered them an opportunity to get a job for sustenance. The remaining 35% were split among previous occupation being security guard, garden services, collecting potatoes and other. Conclusively, all respondents who were employed were in informal sector industry before.

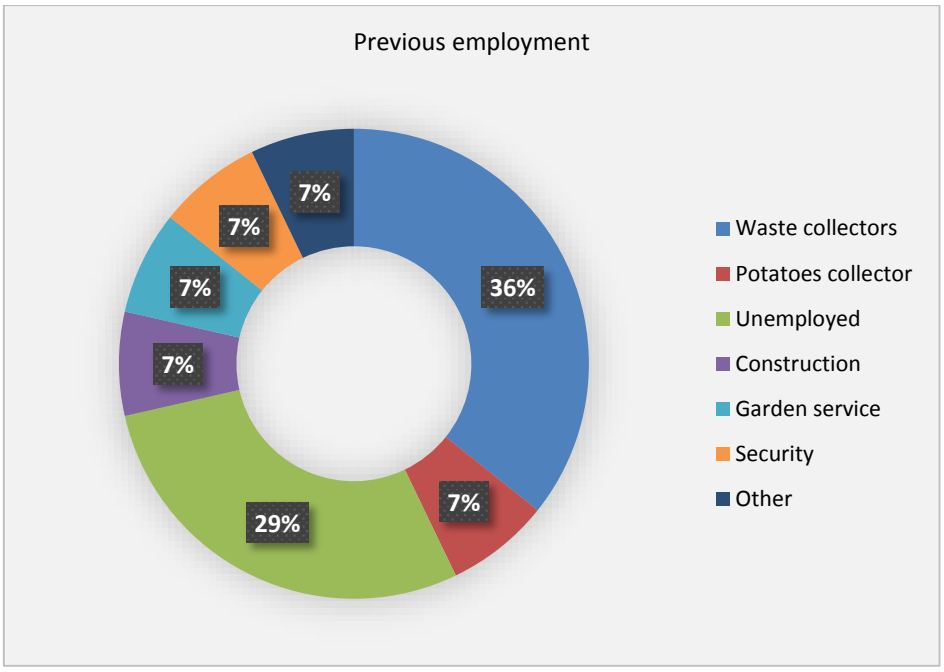


***Figure 4.5*: Previous employment status of waste collectors**

(Source: Personal Analysis)

4.2.1.6 Were you collecting waste individually before joining the cooperative?

Asking whether the respondents were collecting waste before joining the cooperative, gives an understanding of whether the respondents were interested in waste collection or they only later joined in the trade after becoming part of the recycling centre.

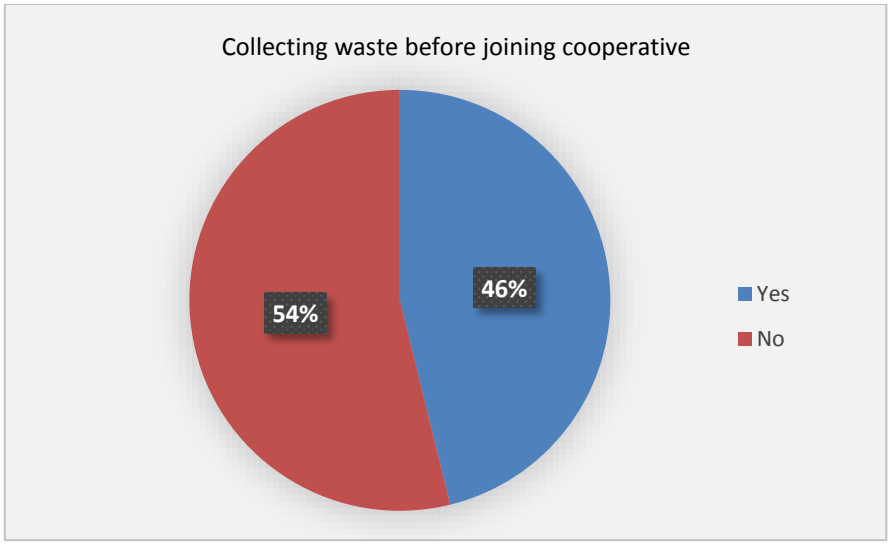


***Figure 4.6*: Waste collection activities prior to joining cooperative**

(Source: Personal Analysis)

As depicted in Figure 4.6, 54% of the respondents were not collecting waste prior to joining the cooperative at the Centre, whilst 46% were into waste collection. None of the donkey owners collected waste before, and the majority of those who indicated they were collecting waste were among the five (5) cooperative members. As a result, only those who were collecting waste prior to joining the cooperative indicated the market they were selling to, whom they identified as Mr. Steenkamp (5 respondents) and Mr. Mabitsela. One respondent indicated she sold to both these buyers. However, selling via the cooperative gave them all better markets to sell their waste to, which is another positive impact of the recycling centre towards the social aspects of the collectors.

4.2.1.7 Did you meet your expectations from collecting waste at your previous jobs?

This expectation includes both financial and social expectations so as to understand whether they were satisfied at their previous jobs prior to joining the cooperative. Values 1 to 5 were used to show levels of satisfaction (Figure 4.7). Six (6) respondents selected value 2 and another six (6) selected value 3 when asked whether they met their expectations in their previous employment. Only one (1) respondent selected value 4, indicating that he mostly met his expectations at his previous employment. Due to the fact that no one chose value 5, it can be concluded that none were fully satisfied at their previous employment.

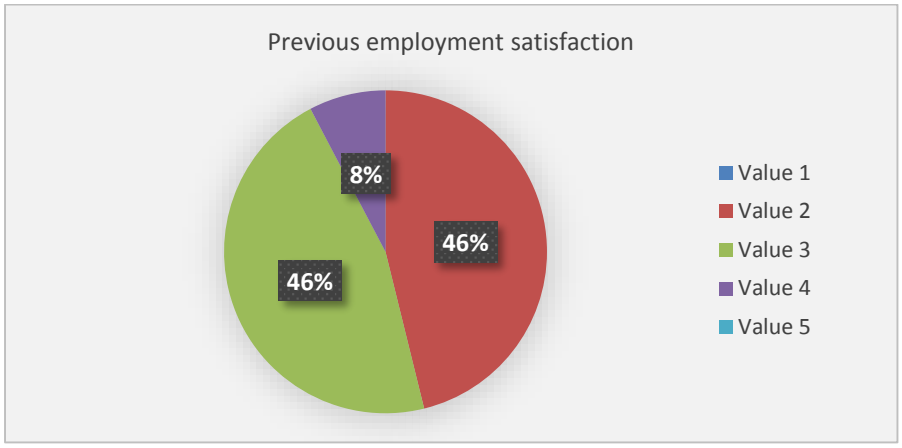


***Figure 4.7*: Satisfaction of collectors at previous employment**
(Source: Personal Analysis)

4.2.1.8 Before joining the cooperative, were you part of a formal entity?

Of the 13 respondents who were involved in waste collection, five (38%) indicated that they were part of a formal entity prior to joining the cooperative (Figure 4.8). The other eight (62%) were not part of any formal entity. Conclusively, the majority of those at the Centre were never

exposed to formal sector employment, and similarly, they opted for an informal job at the recycling centre.

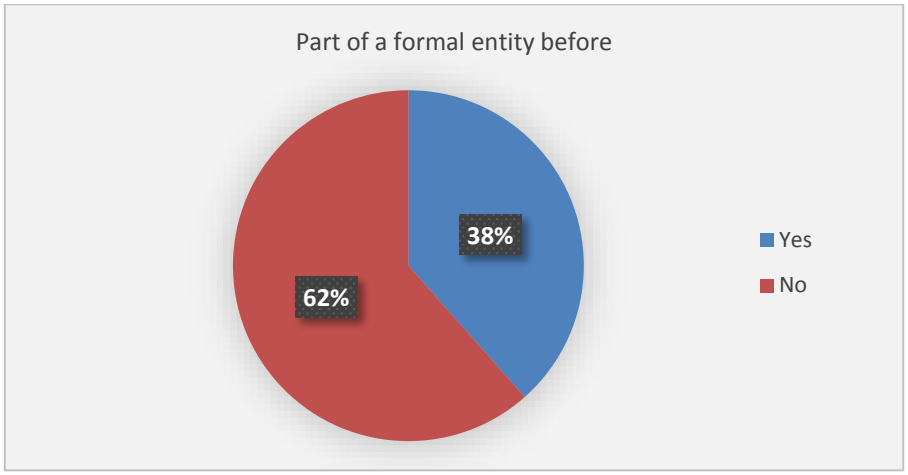


Figure 4.8 **Nature of organisation worked for before**
(Source: Personal Analysis)

4.2.1.9 What would you do if the cooperative closed?

Ten (10) of the respondents indicated that they would continue collecting waste to sustain themselves (Figure 4.9). These 10 also included the five (5) cooperative members who run the recycling centre. Three of the respondents believed that they would either look for another job outside recycling or they would do what they used to do before joining the recycling centre. Only one respondent felt that he would have run out of options and would be left unemployed and jobless if the Centre closed down.

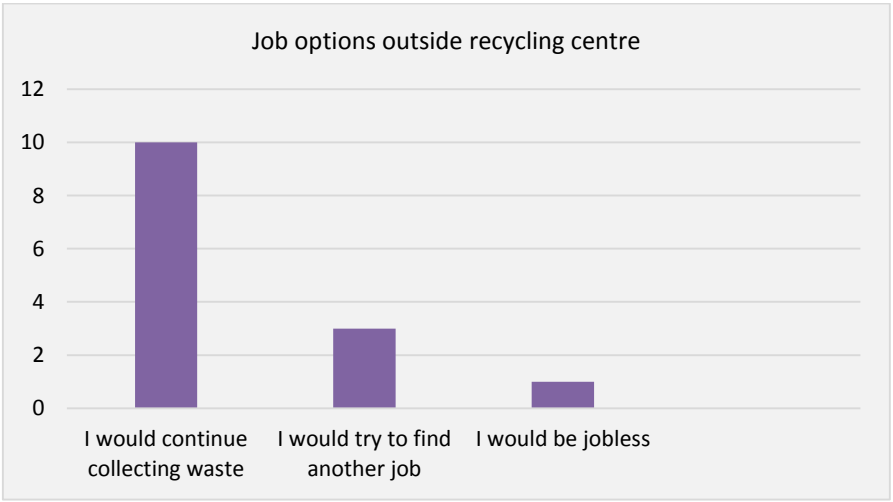


Figure 4.9**: Job options outside waste picking for respondents**

(Source: Personal Analysis)

Having a majority of the respondents indicating that they would continue to collect waste individually is evidence enough to show that the 10 do see value in waste collection activities. Considering that half of those respondents were also not even involved in recycling and waste collection previously, it is concluded that they do realise the value of their day to day waste collection activities at the Centre.

4.2.1.10 Describe your job using three adjectives

The questionnaire also covered how each respondent viewed his or her job at the recycling centre. Five words were given in the questionnaire, which the respondents had to choose from. The choice of these words was based on associations attached to the recycling centre and waste collection activities. These included the adjectives “Dirty”, “Rewarding”, “Unrewarding”, “Hard” and “Interesting”. Out of these, each respondent had to pick three in order of importance (Figure 4.10).

A total of 10 respondents selected “rewarding” and “interesting” as the first and second words respectively. These words were selected by most respondents showing that most of the respondents were finding their work at the centre beneficial and they were willing to continue working there. Between 5 and 6 respondents also chose the words “hard” and “dirty” as a third option, which clearly describes their work at the Centre considering that they deal in discarded waste materials and often they collect waste using trolleys, which is quite arduous. Only one (1) respondent indicated that working at the Centre was unrewarding for him.

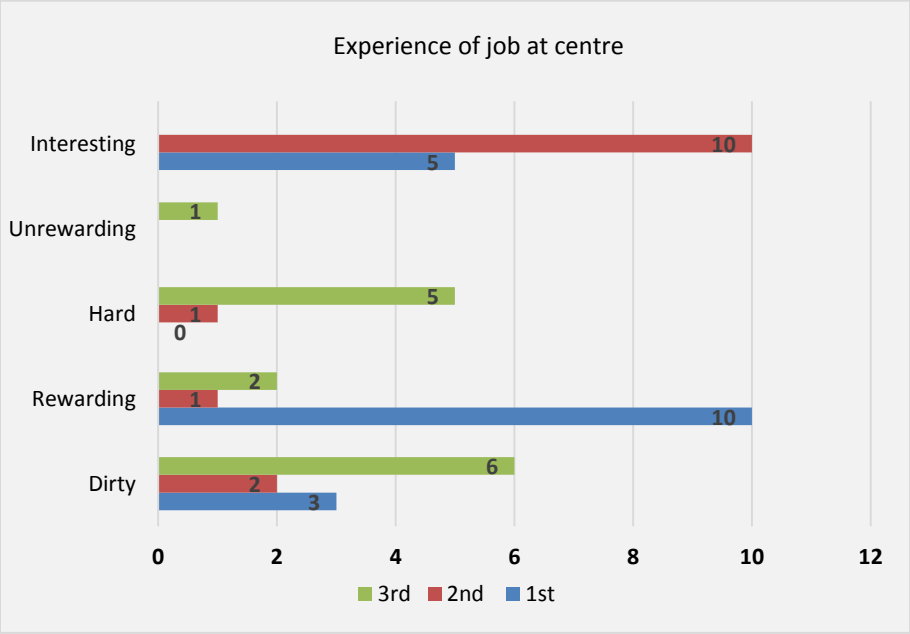


***Figure 4.10*: Experience of waste collector job at Centre**

(Source: Personal Analysis)

Another question asked aimed again at having the respondents describe their working conditions at the Centre prompted the respondents to compare their current job at the centre with their previous occupations. Again, words were selected and used in this exercise, with respondents having to choose between two sets of extremes, “More difficult” and “Less difficult” and between “More stable” and “Less stable”. Of the total number of respondents, 13 out of 14 answered this question (Figure 4.11).

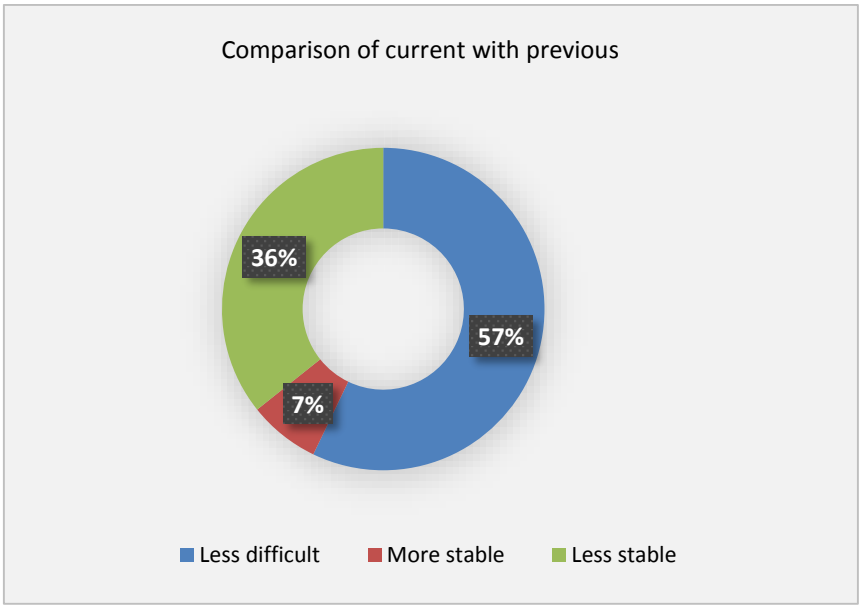


***Figure 4.11*: Description of current job in comparison with previous**

(Source: Personal Analysis)

Over half (57%) of the respondents indicated that their job at the Centre was less difficult as compared to their previous jobs; 7% indicated that their job was more stable whist to the contrary, 36% indicated that they felt their job at the Centre was less stable than before they joined the Centre. All five (5) cooperative members indicated that their jobs were more stable as compared to when they operated from the dumpsite, whilst all waste collectors on foot indicated that their jobs were less stable. As the beneficiary cooperative, it is possible that they are now more stable than before when they were working from the dumpsite unlike the other collectors on foot who have contractual obligations and are more of casual workers for the cooperative. For the donkey owners, a donkey cart management contract exists, which also addressed issues to do with part ownership of the carts beyond a specified contracted period.

On the whole, the Centre is impacting positively on the job creation aspects of the respondents. Where the other collectors lacked training, the cooperative has been able to transfer knowledge on how to collect and sort waste, which is positive. Most individuals indicated that they would continue to collect waste if the cooperative closed down showing an interest in waste recycling among the respondents

4.2.1.11 Do people ask you about waste management issues?

Respondents were also asked if people within their community came to them to ask about waste management issues. Three words were provided for them to choose from. These were "Never", "Sometimes" and "Often".

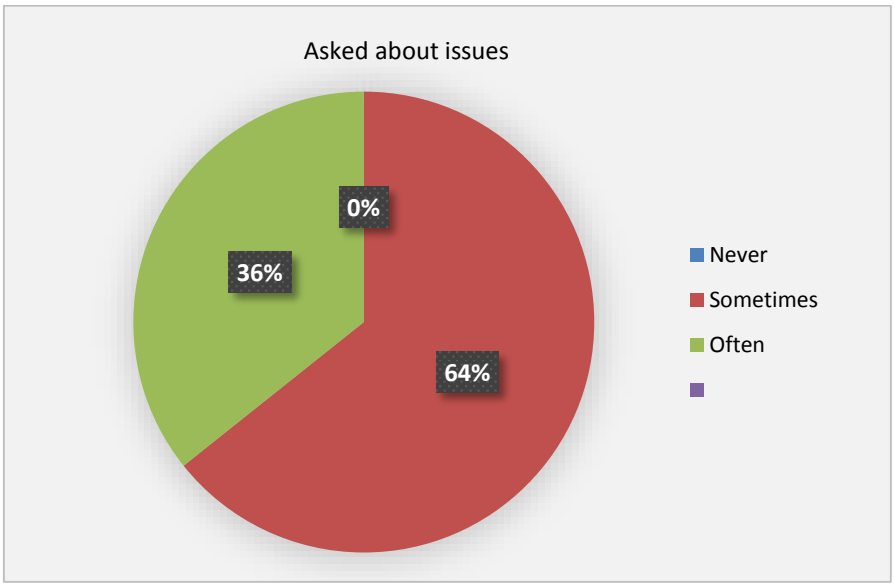


***Figure 4.12*: People ask about waste management issues**

(Source: Personal Analysis)

None of the respondents chose the word “never”, whilst 64% chose “sometimes” (Figure 4.12). An additional 36% selected the word “often”, indicating that for all respondents their recycling activities were attracting interest from other community members who then inquire on these issues from them. An element of information transfer within the community also comes to the fore from this result.

4.2.1.12 Do you feel useful to the community?

The respondents were also asked if they felt useful to the community owing to their jobs at the recycling centre. They were given values 1-3 to choose from, with “1” representing ‘No’, “2” representing ‘Yes’ and “3” indicating ‘A lot’. To this end, all of the respondents chose number 3, indicated they felt useful of some worth to their communities, an indication of how they view their job at the Centre as positively affecting their communities.

4.2.1.13 Do you feel proud?

Similarly, the respondents were asked whether they felt proud of their jobs at the recycling centre. Again, values 1-3 represented ‘No’, ‘Yes’ and ‘A lot’. To this end, all respondents chose value 3, which goes on to show that they had a great deal of pride with their jobs at the recycling centre. This is also an indication of how the respondents value their work in recycling.

4.2.2 Economic Impacts

4.2.2.1 What is your current income at the recycling centre?

Thirteen (13) of the fourteen respondents indicated that their current income was less than R1000 monthly. All collectors including the cooperative earn less than R1000 per month. For the cooperative, a monthly wage was set at R600 per member. However, for the other collectors the amount depends on how much they collect and bring to the Centre as they are remunerated per kilogram of waste collected. A pricing structure was put in place that accommodates both the sustainability of the recycling centre as a business and the sustenance of all the waste collectors.

4.2.2.2 How much did you earn before joining the centre?

A question was asked to the respondents about how much they earned at their previous jobs (Figure 4.13). Of the respondents, 64% indicated that they earned less than R1000 monthly previously, which goes on to show that in terms of their income range from R0-R1000, they have not realised any significant change in income range. Some (29%) indicated that they earned between R1000-R2000 monthly whilst only one (1) respondent indicated that they earned between R2000-R3000 monthly, thereby showing a significant drop in income after coming to work at the recycling centre. Issues identified as being the reasons for opting to work

for a lower wage than before included issues to do with potential ownership and stability of work including better working conditions and growth of the recycling business as well.

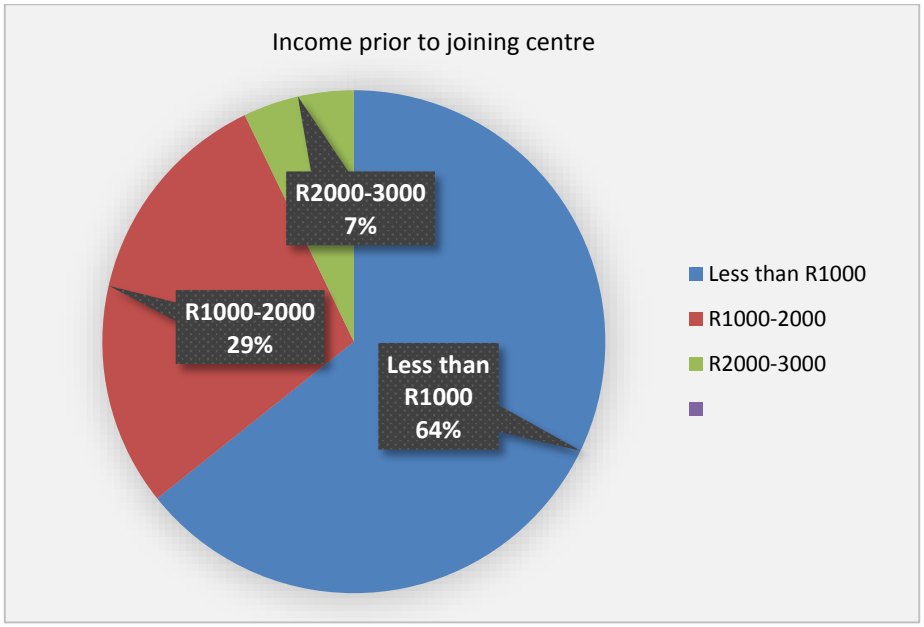


***Figure 4.13*: Income of waste collectors prior to joining the recycling centre**

(Source: Personal Analysis)

4.2.2.3 Household income allocation

The questionnaire also included a more practical exercise, which involved asking each respondent to take ten stones, and based on the income they earn at the recycling centre; allocate the number of stones they would give to particular expenses in their households. The stones thus represented their income at the centre. Areas they had to indicate allocation included how much they give to their spouses, school fees, savings and family expenses. The purpose was to understand how the respondents allocate and prioritise their income and is illustrated in Figure 4.14.

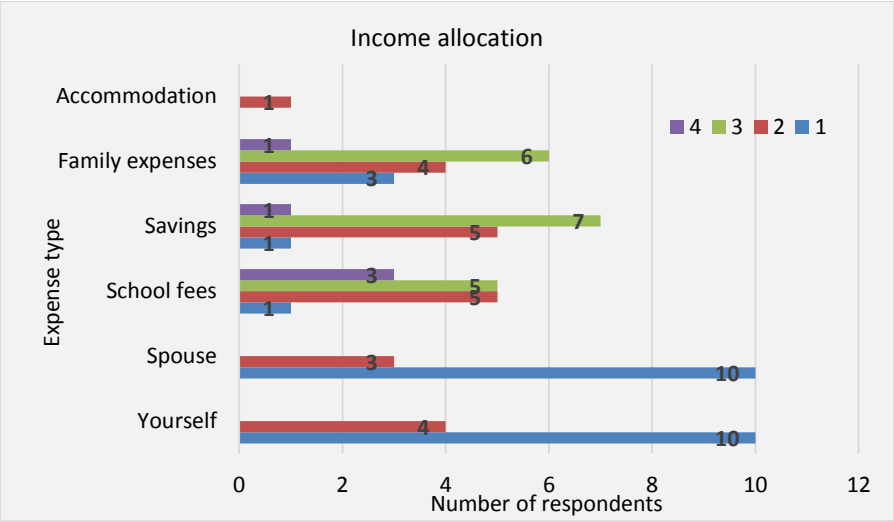


***Figure 4.14*: Home income allocation**

(Source: Personal Analysis)

Ten respondents indicated that they allocated 1 stone each to their spouses and themselves, whilst 4 indicated that they would allocate 2 stones to themselves and 3 indicated they would allocate 2 stones to their spouses. Family expenses, savings and school fees were three of areas most respondents allocated 3 stones. Only one respondent had an allocation for accommodation, with the other 13 indicating that they had no rentals to pay. Figure 4.14 shows that most of the sample allocate their income to cater for their family's needs and savings first before their own personal needs.

4.2.2.4 Since working at the centre, is it easier to pay for your children's education and medication?

The respondents were asked if they found it easier to pay for their medical bills and their children's schooling. The respondents were asked to choose among values 1 to 3 (Figure 4.15).

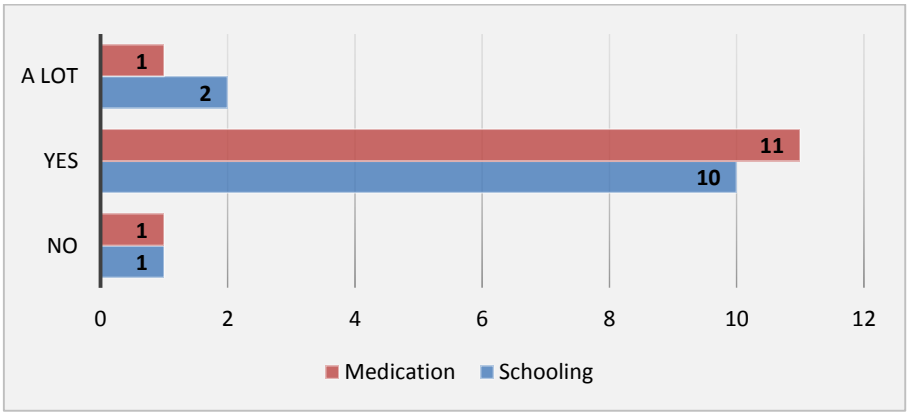


***Figure 4.15*: Medical and education allocation**

(Source: Personal Analysis)

Only one respondent absconded from answering this question. The values 1-3 represent 'No', 'Yes' and 'A lot'. For children's schooling, one (1) respondent chose value "1", 10 chose value '2' and two chose value '3'. Regarding medication, one respondent chose value '1', 11 chose value '2' and only one (1) opted for value "3". This suggests that the majority of respondents were finding it easier to pay for their children's education and medication because of their income from the Centre.

4.2.2.5 Have you made any improvements in your accommodation thanks to your cooperative income?

The respondents were also asked whether they had made improvements in their accommodation owing to income from the buyback centre. Figure 4.16 shows that seven (7) respondents indicated that they had not made improvements in their accommodation after joining the cooperative. Another six (6) indicated they had made changes to their accommodation, whilst one (1) respondent indicated she had positively changed her accommodation a lot as compared to before. The percentage of those who had improved their accommodation is split in the middle with those that indicated they had not changed. This shows variances with one half having benefited owing to the income and changed their accommodation and the other half having not changed.

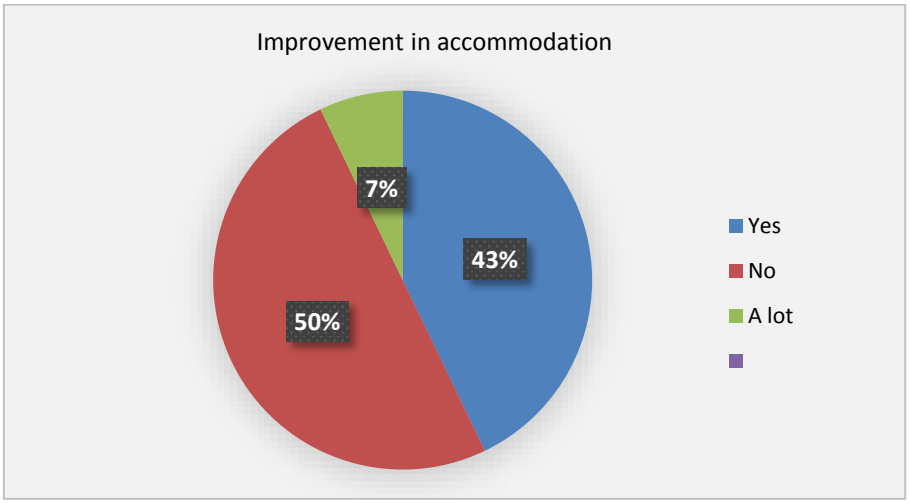


***Figure 4.16*: Improved accommodation**

(Source: Personal Analysis)

4.2.2.6 Today, do you have other ways to earn money?

This was a YES/NO question which aimed to understand whether the respondents are solely reliant on the recycling centre for income or have other means of earning income (Figure 4.17).

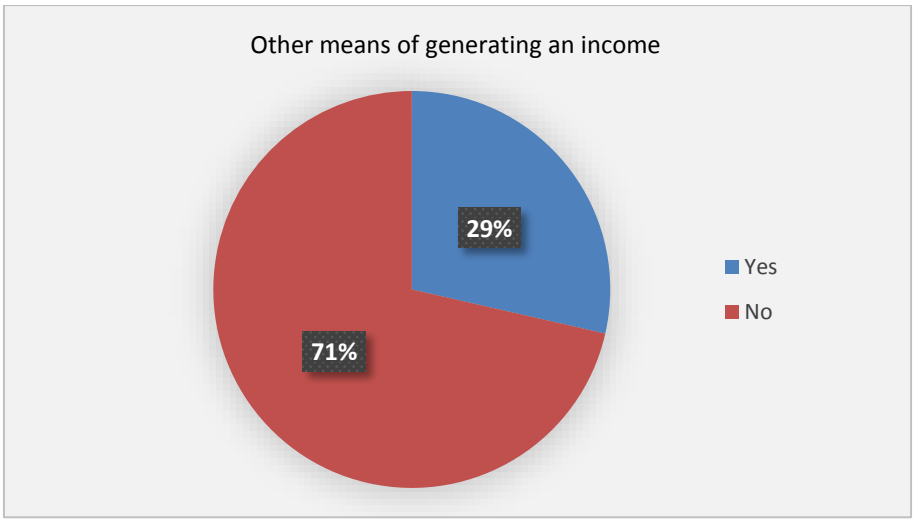


***Figure 4.17*: Other means of earning income**

(Source: Personal Analysis)

Ten (10) respondents indicated that they had no other means of earning an income whilst four (4) respondents indicated they had other means of generating income apart from what they earn at the Centre. Those that have other means of income generation indicated they got income from child grants (2 respondents), water fairs (1 respondent) and one (1) had a tavern business. This generally shows that the majority of those interviewed relied on income they got from the buyback centre for their survival, another positive economic impact of the Centre.

4.2.2.7 Reasons for joining the recycling centre/cooperative

Various responses were given when asked to choose from three reasons as to why the members joined the recycling centre/cooperative. The respondents had to choose from that they were “More powerful” (economic), “More efficient” (economic/social) and “Socialising” (social). Each respondent had to rank these in order of priority, starting with the most relevant response down to the least relevant.

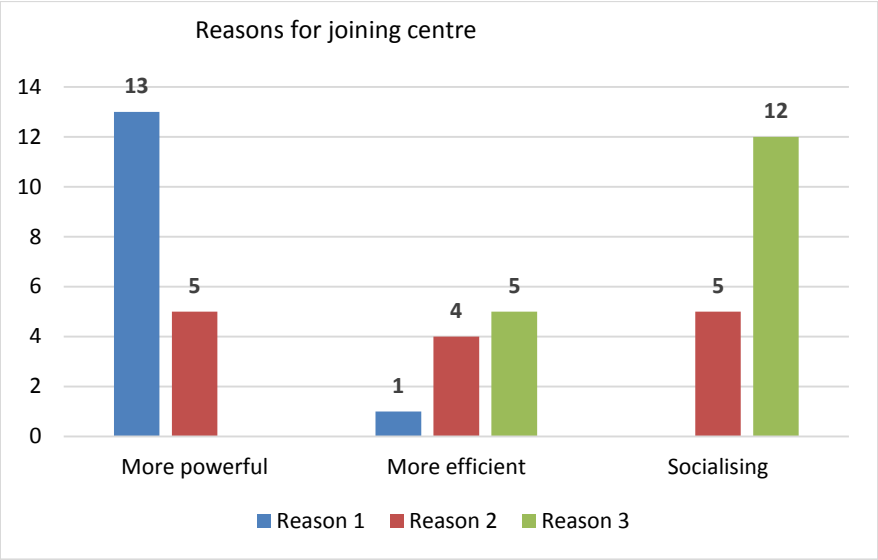


***Figure 4.18*: Reasons for joining the recycling cooperative/centre**

(Source: Personal Analysis)

"More powerful" or being economically empowered was chosen by 13 respondents as their first reason (Figure 4.18). An equal number of respondents (5) rated "socialising" as a second reason for joining the recycling centre. "Socialising" was also chosen by 12 respondents as the third and least reason why they joined the recycling centre. The main reasons for joining the recycling centre were economic. None of the responses opted for "Socialising" as the main reason for joining the recycling centre. On economic impacts, the Centre has proved to be impacting positively on the respondents, though some earned more income prior to joining the centre. Most respondents are able to make do with the income they are getting from the centre and most are able to meet their family expenses.

4.2.2.8 Are you confident in the future of the buyback centre?

In trying to understand if the respondents viewed the Centre as a long-term sustainable option of employment, they were asked if they were confident in the future of the project. They were given values 1-5 to choose from, with '1' representing the "least confidence" and '5' indicating the "most confidence" in the centre. All 14 respondents chose value '5', indicating the highest level of confidence in the recycling centre. Their confidence in the Centre also has a sustainability component to it, as it shows that, in their opinion, the centre has potential to continue being operational beyond their involvement there.

4.2.2.9 What main difficulties do you face with the cooperative/centre?

This question encompassed all aspects of sustainability including economic, social and environmental impacts. However, as to the nature of responses given, it has been discussed under the economic impacts.

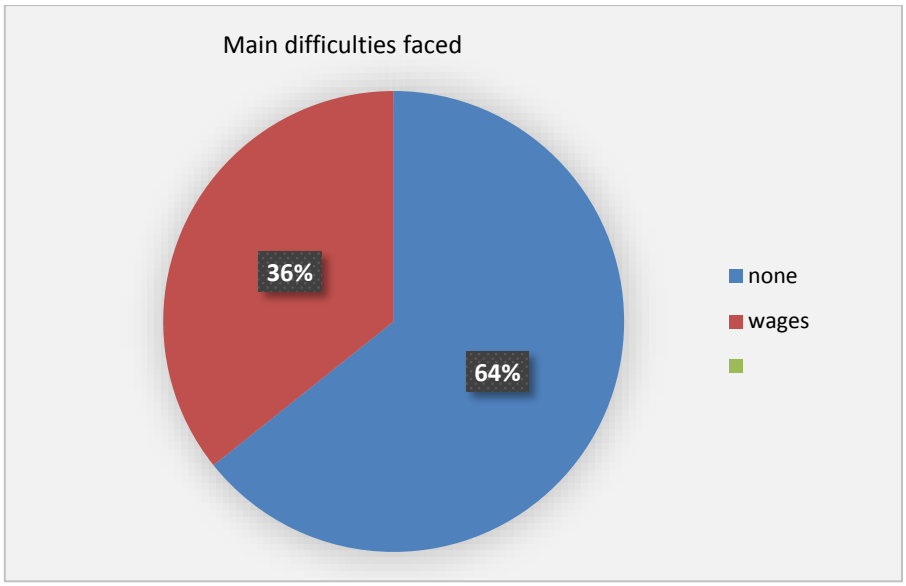


***Figure 4.19*: Main difficulties faced with the cooperative**

(Source: Personal Analysis)

According to the Figure 4.19, 64% indicated they had no major difficulties with the Centre, whilst 36% indicated that their main challenge had to do with wages, which they hoped would be increased. It is imperative to note that the 36% were the cooperative members, who also had a fixed monthly allowance of R600. The other collectors and the Centre Manager did not indicate wages as an issue at the recycling centre.

4.2.3 Environmental impacts as evaluated through the questionnaire

The results highlighting the environmental impacts are based on the results from the questionnaire, direct observations including compliance issues and how the waste is collected, sorted and handled at the recycling centre from the point it is brought to the Centre until it is sold. All respondents in the questionnaire exercise indicated that they believed that recycling was beneficial to the environment, as it helped keep the environment clean. Their personal experiences when collecting waste led them to choose these responses.

4.2.3.1 Do you think the P.E.A.C.E buyback centre is contributing to improving recycling and waste management issues in your community?

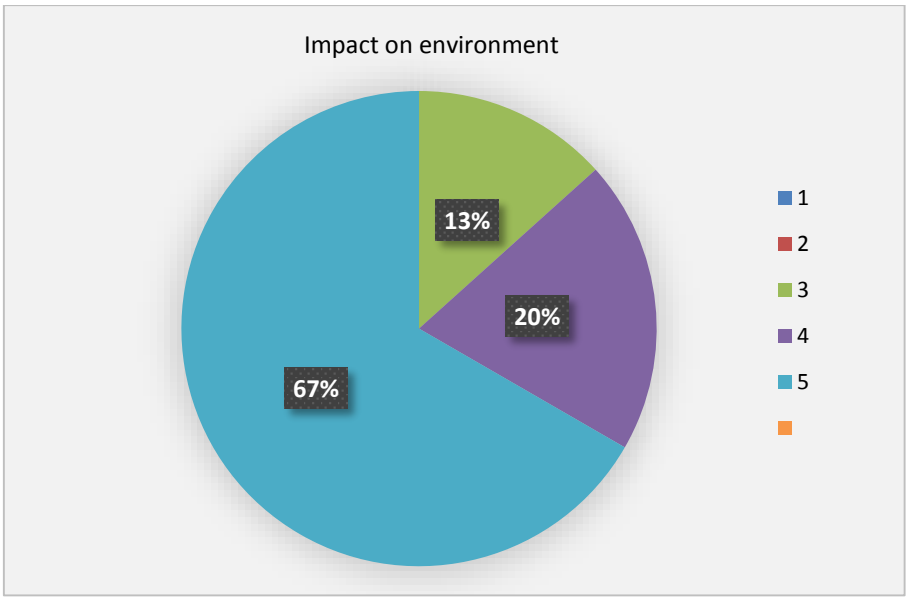


***Figure 4.20*: Impact of buyback centre on environment**

(Source: Personal Analysis)

Figure 4.20 above shows that 14 respondents considered that the Centre does have an impact on waste management and recycling issues within Senwabarwana. The values '1' to '5' were given as a random scale for the respondents to choose from, with '1' representing the least impact and '5' indicating the most for impact. Of the respondents, 67% chose value '5' whilst 20% chose value '4' and 13% chose value '3'. None of the sample chose values '1' and '2' indicating that they all saw the Centre as contributing to recycling issues.

4.2.3.2 Are there any negative impacts of buyback centre on environment or on human health?

None of the respondents saw the centre as having any negative effects on humans or the environment, indicating that they all viewed the centre as having a positive contribution to the environment.

As depicted in Figure 4.21, all 14 respondents were asked whether they promoted the environment in their community. This included sorting of waste for recycling, sending off waste to the dumps and taking care of the environment through recycling. Ten (10) respondents indicated that they advocated for sorting of waste, whilst six advocated for sending of waste to dumpsites. Another six (6) also indicated they advocated for the proper maintenance of the environment through recycling. Of the 14 respondents, four (4) did not select any activity that advocated the environment. However, the ten (10) that indicated they were advocating for the identified line items, show that they are interested in environmental issues which will bring about environmental sustainability or add value to how they collect waste.

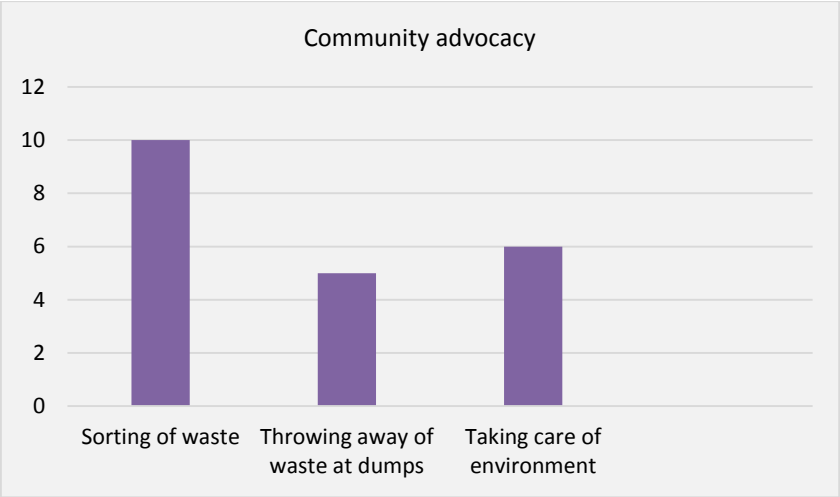


***Figure 4.21*: Advocating for waste sorting, dumping and taking care of environment**
(Source: Personal Analysis)

4.2.4 Environmental impacts at the recycling centre based on observations and compliance

The environmental impacts as observed directly at the recycling centre includes the actual location of the Centre in relation to its surrounds and how the waste is collected, sorted stored and sold at the recycling centre. It also covers the compliance issues with regard to the specific legislation governing waste recycling issues.

The Government Gazette (32368; 2009) for the National Environmental and Management Act: Waste Act (Act. 59 of 2008) may be regarded as the basis for legislation that regulates recycling buyback centres. This is through the licensing of such facilities so that they comply with environmental regulations to minimise potential environmental risks. Commencing of activities on such sites should only be done after proper licensing has taken place. The Gazette splits activities that handle waste into two categories (Categories A and B). Category A looks at non-hazardous waste, which fits in with the recycling activities at the research site. Perhaps the most relevant to the recycling buyback centre in question, is it implies that any waste re-use, recovery and recycling facility, including facilities that conduct waste sorting and baling, that have the capacity to process in excess of one tonne of general waste per day, need to be licensed.

Government Notice R633 in Government Gazette 39020 dated 24 July 2015 highlights new waste management activities that require licences for their operations. Still under Category A, are those activities that include the sorting, shredding and baling of waste, amongst other activities, at a facility with an operational space in excess of 1000m^2 or recycling of general waste in an area in excess of 500m^2. To this end, it was observed that the Centre currently operates within the framework of the legislation as it only utilises a small portion of the whole site for waste recycling activities.

With regard to any other environmental quality process, such as an environmental impact assessment, this was not conducted before setting up of the buyback centre. However, the land on which the Centre was set up was designated by the local Municipality for such purposes under a 10-year lease with the P.E.A.C.E Foundation and the beneficiary cooperative. This covers part of the compliance issues since the allocation of the land was authorised by the local authority having identified the site as suitable for waste recycling purposes.

The whole site is fenced with different entrance and exit points (one double main gate and a smaller gate), whilst part of the site has been subdivided into a smaller plot earmarked for future P.E.A.C.E Foundation projects expansion. The fencing appeared to be adequate to keep waste from moving out of the plot or being blown away by wind into surrounding areas, thereby reducing waste pollution into surrounding areas. The site is mainly surrounded by open land which, during the research period, was being used for agricultural purposes. Hence, no direct adverse impacts were seen to have being affecting the environment.

A contract has been put in place to cover, among other issues, remuneration of the cooperative, ethics and operational conditions. This is the basic regulatory document at the buyback centre. One clause can be singled out which deals with the basic day-to-day environmental health and safety issues at the Centre urging all cooperative members to keep the centre and ablution facilities clean and to also observe hygiene within the premises of the buyback centre. It also encourages the discarding of all waste that would not be used for recycling in a bin available on site.

The Centre Manager and the Cooperative Chairperson are thus responsible for enforcing this clause (together with the contract as a whole). As the buyback centre expands to enable more people to bring in recyclables, it would be necessary to revise the clause on environmental safety and health issues and possibly expand this into a code of environmental, safety and health actions that would also be able to regulate the activities of other waste pickers who would be bringing in waste to the Centre.

A positive environmental impact of the buyback centre, though not directly linked to the recycling centre, is the setting up of bins within Senwabarwana facilitated by the P.E.A.C.E. Foundation as a broader initiative. The bins were set up in order to promote awareness on the importance of reducing litter in Senwabarwana. The bins were set up, with assistance from the municipality, and Photographs 4.1 and 4.2 show how the bins have been useful in helping reduce litter in Senwabarwana.

***Photograph 4.1*: Dumping hotspot in Senwabarwana**

(Source: Personal Image)

***Photograph 4.2*: Same hotspot after setting up of bins**

(Source: Personal Image)

There is a sharp contrast between the before and after installing the bins as the community members are now able to dispose of their litter in bins, whereas before the bins, they would improperly throw away the litter.

4.2.4.1 Collection and sorting of waste

The centre only collects and sorts dry solid waste and no organic waste accepted. This has been due to the need to limit any contamination (through wet waste) or potential human health hazards since there are not any measures in place to mitigate any negative impacts. Waste collection involves the use of trolleys that are pushed on foot and donkey carts covering an 8km radius. Recently, a 1.5 tonne truck and trailer had also been purchased to help assist with the waste collection process for the recycling centre. Five donkey wagons had been purchased collecting waste within a radius of 8kms from the recycling centre.

It is important to note that the use of both the trolleys and the donkey wagons bring an environmentally friendly aspect to the project as fuel powered vehicles emit carbon monoxide, which is a dangerous greenhouse gas. Apart from being environmentally friendly, the use of these trolleys and donkey wagons has also shown to cut down on costs at the recycling centre, which can be linked to the economic benefits realised through the Centre and its long term-sustainability. However, a third mode of collection was used at the buyback centre. This is through making use of the municipal collection service system, which is used to bring in collected waste from the Senwabarwana dumpsite to the recycling centre. All three modes of collection should ideally complement one another. Below are photographs showing the collection processes (Photographs 4.3 – 4.6).

***Photograph 4.3*: Waste collection in town using trolley (June 2014)**
(Source: Personal Image)

***Photograph 4.4*: Collection of waste at the dumpsite**

(Source: Personal Image)

***Photograph 4.5*: Delivery of waste using municipal compactor at buyback centre**

(Source: Personal Image)

***Photograph 4.6*: Donkey cart collects waste within residential area (July 2015)**

(Source: Personal Image)

To reduce spillages when transporting, the recyclable materials waste is loaded into bulk collection bags before it is loaded into the Municipality's compactor or by the donkey owners themselves. Masks and gloves are also provided to the collectors when they collect and sort the material. The Centre does not have foul smells, but recyclables at the Centre risks being contaminated, as most of them were reclaimed from the local dumpsite.

***Photograph 4.7:* Sorting area at Centre**

(Source: Personal Image)

The centre also has functional water and flushing toilets. This can be regarded as one of the most important prerequisites of such sites, as contamination of the environment and health hazards to humans can easily occur in the absence of water. Observation showed that the ablution facilities were clean and the cooperative had the responsibility of cleaning them daily. In addition, it was also observed that the sorting area was clean, with stacked bales of recyclables stored in one area, while sorting and baling was conducted in another. Photograph 4.7 depicts the stored bales directly outside the sorting and baling area.

The sorting area is adequately fenced and gated, as this is where cardboard and whitepaper are usually sorted. It also acts as a store for these materials and the baled cans, as their exposure to the sun and other weather elements can end up being damaged. Paper and cardboard are also prone to being blown by wind and damaged by rain, which could possibly end up causing land pollution both on and off site. The fencing ensures that these materials are contained in one area regardless of the weather elements.

There was no evidence of environmental degradation or adverse impacts observed that can be directly attributed to the collection and sorting of waste materials being left in the open. The cooperative put some of the baled waste on wooden pallets in case of rain, and this enables them not to be washed away by the rain, which potentially can cause pollution on- and off site.

4.2.4.2 Handling, baling and selling of waste on site

The flow of how waste is handled, baled and sold on site is best represented using images which were taken at different times of the study (Photograph 4.8 and 4.9).

Photograph 4.8: **Sorting of PET before being baled**

(Source: Personal Image)

Photograph 4.9: **Baling of materials**

(Source: Personal Image)

Photograph 4.10: **Selling waste**

(Source: Personal Image)

As can be seen in Photograph 4.10, the buyers also cover the load when transporting to minimise potential environmental impacts through spillage on roads and in communities as they transport the waste. Photograph 4.11 shows how any spillage, wastage or unmarketable materials are gathered together, put into bins and are then sent off to the dumpsite before they

become an environmental or human health risk on the site. This keeps the negative environmental impacts to a minimum.

Photograph 4.11: **Disposal of waste**

(Source: Personal Image)

Waste material is sorted according to different types (paper, plastic and cans) before it is baled. In some cases, the material is washed to deal with contamination issues. The centre has no proper washing facilities for the materials and any materials that require washing are washed on a concrete slab using a water hosepipe and water available on site. The effluent usually ends up seeping underground or in some instances, when it is washed directly from the tap, ends up in the water drain. However, most of the materials are sorted and sold without being washed.

Due to the limited storing space, potentially there can be contamination of the land where some of the waste is stored. The land is not paved, and in cases where chemical containers are collected for recycling, some of the chemical residue may end up seeping into the land, potentially affecting the underground water. To reduce the chances of contamination, it is recommended that proper waste washing facilities are set up.

In conclusion, the Centre has shown to have positive environmental impacts, as both the respondents and the direct observations yielded outcomes that were positive. The Centre has the necessary requirements for its operations, and observations have illustrated that potential negative environmental impacts are kept to a minimum. The outcomes from the environmental impact, together with the social and economic impact, give a conclusive result that though

there is room to increase on the impact, the sustainability of the Centre is dependent on how these three impacts will be improved and enhanced in future. However, there will be a need for further research and assessment as the Centre grows and impacts on more communities and individuals.

4.3 OBJECTIVE 2: To investigate the problems faced in rolling out semi-urban recycling and buyback centre initiatives

Problems faced in rolling out semi-urban recycling initiatives are varied from project to project, with some linkages existing in some cases. Problems that the waste collectors face may differ from how, for instance, a donor or support agency may view such issues owing to the points of views that exist from the different circumstances they have to deal with. One of the results from this study that could be regarded as universal, is the issue of access to funds to start the recycling buyback centres and cash flow management issues. An analysis based on direct observations through the involvement in the case study, together with responses from the sample of 14 participants from the recycling centre are used to achieve this.

In addition, interviews with support agencies within the recycling and cooperative support network, namely Limpopo Development Agency and PETCO were also conducted. Topics were used for these interviewees in order to obtain their opinion on what some of the challenges were in recycling activities. The interviewees raised varied points based on their experiences and opinions, which will be presented in point form. The topic on what challenges are faced in the recycling industry was also used when interviewing the two owners of the companies that bought waste from the recycling centre. These two were chosen due to their involvement in the location of the case study. Their opinions would be specific to the project and how they operate in waste recycling in Polokwane.

4.3.1 Analysis based on observations and assessment of the project

This analysis based on the day-to-day running of the project are credible in highlighting the problems in rolling out semi-urban recycling and buyback centres with regard to the case study. In all fairness, these challenges are pointed out and where some problems can be merged with what other interviewees have mentioned, it will be done accordingly.

4.3.1.1 Access to funding

Funding for start-up recycling initiatives, particularly those viewed as community-based, is not easy to access as donors often want to focus on initiatives that already have a track record of operating. Rural and semi-urban recycling initiatives are not often given priority, as less waste is generated in these areas. A list of ten (10) cooperatives registered through the Limpopo Business Support Agency (now Limpopo Economic Development Agency) showed that all but

one of the enterprises, registered as recycling cooperatives, had been compelled to cease operations. Among other problems was the unavailability of funds as the case study cooperative, Thinana Cooperative, was indicated as the only traceable operating entity.

In the current case study, the business planning, fundraising and management of finances have been done through the P.E.A.C.E Foundation. Most of the funds were channelled from donors, locally and abroad, and from Enterprise Development partners of the Foundation. The cooperative itself had not been able to access any funding because they never applied for any funding from any donor before, since they had no knowledge of such funds and lacked the expertise and capacity to apply for funding.

4.3.1.2 Unavailability of basic and affordable infrastructure

Before the buyback centre became operative, basic infrastructure was put into place at the Centre. This included water, electricity, ablution facilities, office equipment (including a laptop, printer and internet connectivity) and the basic machinery for day to day operations. A hand operated manual baling machine was also sponsored for the centre. The availability of electricity, which powered both the office equipment and the water supply via the borehole was a daily essential. However, the three-phase electrical supply which was initially put up on site was not the best option for the Centre at the start-up phase. Billing records provided by Eskom revealed that even though the electricity was only switched on at the Centre on 31 January 2014, Eskom had begun charging the cooperative for the use of the installed transformer from October of 2013, which was well before the cooperative moved into the Centre. The monthly network charges for the transformer, without the actual billing of electricity used, averaged up to R2,000. The cooperative's income at this start-up stage was not going to be able to cover such costs, including remuneration. In the end, a solar powered option was installed, which reduced the costs incurred at the Centre. However, this affected operations as the use of a manual baling machine was not as effective as using an electric powered baler, which would still require use of the costly three-phase electricity connection.

4.3.1.3 Marketing of some waste materials

A pricing structure was put in place based on prices determined by the buyers. However, with two firms offering to buy from the cooperative based on what these firms deem as valuable and marketable for them, some waste materials have been left unmarketable either because of poor pricing or because of not having markets at all. In the case study, all forms of glass were not being traded because of the low profit margins realised from this material. The Department of Environmental Affairs and Tourism (DEAT) in its 2005 publication of the National Waste Management Strategy Implementation South Africa states that the glass recycling business has tight margins and thus is based on volumes in order to make it

profitable. To cover R1 in overheads, 25 post producer or 47 post consumer bottles need to be collected (DEAT, 2005). Such volumes are not easily attainable in a semi-urban setup such as this.

Photograph 4.12: **Nappies on Senwabarwana dumpsite**

(Source: Personal Image)

Another material identified as a problem were disposed nappies and diapers which are causing a challenge to the local municipality, because they are taking up space at the dumpsite and are non-biodegradable (Photograph 4.12). Through meetings, it was established that diapers were also a huge concern for the adjacent Molemole Municipality. Being non-biodegradable and associated with human waste, they pose huge environmental and human health problems in Senwabarwana.

4.3.1.4 Cash flow of the recycling enterprises

Cash flow proved to be an issue for the recycling cooperative, owing to the fact that they sold recyclable materials via middlemen for lower prices and when they get paid for the materials sold, the income would at times not cover all of their expenses. In some instances, when the middlemen faced financial problems or delayed in paying the cooperative, the cooperative would fail to meet its own monthly financial obligations. There is a need to mitigate such challenges through bypassing the middlemen where ever necessary and ensuring proper contracts are put in place with them.

4.3.1.5 Lack of full political will and support from the local municipalities

In light of the waste hierarchy which promotes waste re-use and recycling and advocates for landfilling as a last option, local municipalities have an obligation to look into activities that promote the waste hierarchy, including support for recycling initiatives. As of 2011, Statistics

SA gave the number of households within the Blouberg Municipality as being 41 192, with a weekly refuse removal rate of 20.7% (Statistics SA, 2011). This shows there is a backlog in refuse removal and the municipality is failing to cope with this backlog even though it is their mandate to collect waste. In principle, the municipality is committed to assisting the recycling initiative, but there is a limit to the extent to which this commitment is in fact practically executed. Based on some of the feedback (both electronically and telephonically) from those involved in the day-to-day running of the project, this lack of execution, including the lack of collection of waste by the municipality from some households, has shown to impact negatively on the project, as it is largely based on adequate waste volumes for its success.

4.3.1.6 Lack of business acumen, mentorship and training among waste pickers

As an observation, there also appeared to be a lack of business mentorship and skills within the beneficiary group, and this often led to a dependency syndrome of the group to get financial assistance. In order to investigate this problem further, on the 27th of October 2014, a telephonic interview was conducted with Ms. Lebohang from the Limpopo Economic Development Agency (LEDA), a body which has been instrumental in registering cooperatives in Limpopo. The interview, based on the topic of challenges faced by cooperatives, was to get an informed opinion based on LEDA's experience. The interviewee was therefore asked whether business mentorship or the lack of thereof within cooperative structures affected sustainability of these cooperatives within Blouberg Municipality based on the list of non-functional cooperatives provided electronically. Her immediate response was the lack of business mentorship affected business sustainability of these cooperatives. She further identified three main challenges to further expand on her response and opinion. Firstly, the lack of proper business planning and business mentorship of the cooperatives led to most cooperatives lacking access to capital to buy machinery or cover their start-up costs, hence leading to their collapse. Apart from the machinery, most of the cooperatives lack knowledge on recycling and fail to market and negotiate prices for their business.

Secondly, she indicated that most cooperatives were being formed not because of the need to run a sustainable business, but out of desperation. Some cooperatives are being formed because this is the only way they can access funding from government departments, such as the Cooperative Incentive Scheme from the Department of Trade and Industry. After receipt of such funds, most cooperatives collapse usually due to misuse of the funds. A third reason provided was some cooperatives, especially in waste management, do not have the knowhow to conduct proper feasibility studies to establish the sustainability of their business before embarking on the venture.

4.3.1.7 Ideal business model for rural waste management: Cooperative versus capitalistic model

Closely linked to the previously identified problems is identifying the ideal model for running a recycling project, which is in a semi-urban area and has a community development focus. The triple bottom-line impacts of social, economic and environmental benefits of the case study mainly focus on the human and community development aspects, including preserving the environment. However, an equally important aspect which requires consideration is the sustainability through having a solid business model, which can impact on more waste collectors and communities while also growing into a self-sustaining business. The International Cooperative Alliance (n.d) defines a cooperative as an autonomous association of persons, who voluntarily cooperate for their social, economic or mutual benefit. The cooperative structure can be an ideal vehicle for community development. If properly coordinated, a cooperative can operate a sustainable business that can stimulate the local economy of an area. However, in the case study, analysis based on observations made and involvement with the project showed challenges in how the cooperative operated, with the chairperson being the dominant individual in the group, who usually manipulates the other members at the expense of the business.

4.3.2 Problems identified with those working at recycling centre and interviews with stakeholders from industry

The questionnaire given to the 14 respondents working at the Centre had a section where they were asked if they were facing any problems at the Centre or if there were particular recommendations they would want to put forward so that they could operate more efficiently. Nine (9) respondents indicated that they had no challenges or problems, whilst five (the cooperative) indicated their problem was the wages, as they regarded them as little (Figure 4.22).

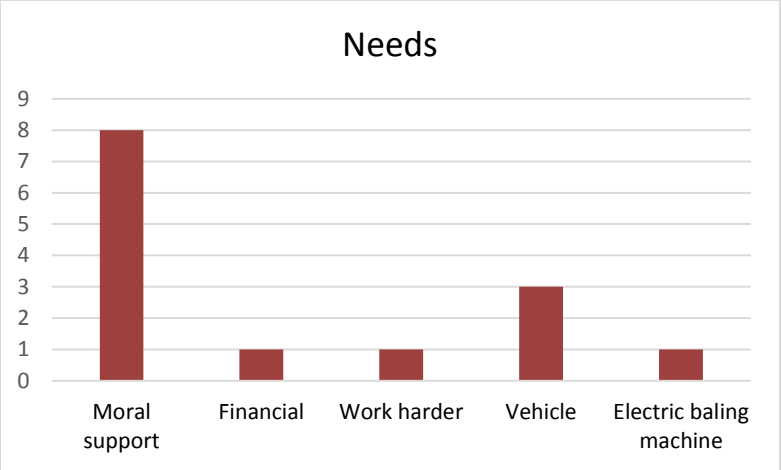


***Figure 4.22*: Needs of respondents**

(Source: Personal Image)

Eight (8) respondents indicated they wanted moral support most than any other need. Moral support in this context covered issues to do with encouragement and esteem issues for the respondents, and did not include any business related issues. These eight included the four (4) waste collectors on foot and three (3) collectors using donkey carts and the Centre Manager. Three (3) individuals indicated they wanted a vehicle for the waste collections and one (1) indicated she wanted an electric baling machine. All these respondents were apparently from within the beneficiary cooperative. There is a contrast between the needs of the majority of the collectors as compared to four of the cooperative members, as the one group is in need of emotional support whilst the other requires material support in pursuing their work at the Centre.

The opinion for other problems associated with not necessarily semi-urban recycling, but waste recycling projects and businesses, especially those run via cooperatives, was gathered through an interview with Mr. Munyai, a representative of the PET Company of South Africa (PETCO). This is an organisation that promotes recycling of PET through supporting recycling cooperatives and small to medium and micro enterprises. The choice for getting an opinion from PETCO was due to their experience in dealing with different recycling initiatives throughout South Africa and their support to the case study. This interview was done face-to-face and was conducted on the 22nd of June 2015 using random questions rather than structured ones.

The findings of the interview, classified as challenges in waste recycling, are thus provided below. Telephonic interviews were also conducted with the two owners of recycling entities that bought waste from the buyback centre, to establish what challenges they faced within their own businesses or in dealing with smaller recycling entities. The points to follow cover the interview with the PETCO representative and the outcomes from the telephonic interviews with the buyers is presented after PETCO's input.

The interviewee was asked what in his opinion as a representative of PETCO dealing with start-up recycling cooperatives and initiatives were the challenges these start-ups faced, which hindered advancement of their recycling business and in some instances led to the entire collapse of these businesses. His responses are given in point form below, and expanded in some instances based on his opinions.

4.3.2.1 Presence of middleman

In his response, Mr. Munyai identified the middleman as being necessary especially to the smaller recycling initiatives, but also being a hindrance owing to the skewed pricing structures the middlemen often offer to their suppliers of waste materials. He mentioned that frequently, the recycling cooperatives and kerbside collectors do most of the hard work through collecting

waste, but often get the least returns because of their limited quantities of waste, and thus their limited access to the end markets that offer the best prices. He also alluded to the waste chain hierarchy as discussed by Wilson *et al*. (2005) and for this study, discussed in Chapter 2, which sees the informal/kerbside collectors being at the bottom of the hierarchy, followed by the cooperative structure, the middlemen and ultimately the end markets. This, unfortunately, he pointed out, was an unavoidable truth within the recycling industry.

4.3.2.2 Material pricing

Material pricing was influenced by the source of the waste materials and where one would be selling it. Mr. Munyai indicated that at present most of the waste that was being recycled in South Africa was coming from landfill sites, as separation at the source, which enables interception of waste before it is contaminated at landfills, is not being practised on a large scale. This is also closely linked to the middlemen problem, as at each level until you get to sell the waste to the end user market, the pricing is bound to be different. Put into the context of this case study, the current going rate of selling aluminium cans via the middlemen is R4/kg, when the middleman collects from the Senwabarwana.

If the recycling centre produced enough volumes to hire a truck and deliver to the end market, which is Collect-A-Can, they would be getting R10/kg rate, whilst if the company was to collect from them, they would be getting R9/kg. These are prices independently verified with Collect-A-Can. This reveals how skewed the pricing structure via the middleman becomes. However, Collect-A-Can does not have a presence in Senwabarwana, and thus the cooperative has to go via the middlemen to sell their waste material. Other issues that influence the pricing of the waste were the quality of the waste material (clean or dirty) and the weight of the materials sent off to the market.

The June 2015 industry newsletter of PETCO also touched on the pricing issue in one of its sections, but mainly alluding to the influence of external or international forces. In the newsletter it is stated that the drop in international oil prices from the end of 2014 to 2015 led to a drop in virgin PET prices, making it difficult to operate viable recycling operations (PETCO, 2015). This is because virgin material (or new and not recycled) prices effectively operate as a ceiling for recycled PET prices and the continued lowering of the ceiling and rising production costs owing to decreased oil prices has a direct bearing on recyclers globally.

4.3.2.3 Equipment challenges

The interviewee affirmed that some machinery was not adequate particularly for start-up enterprises, as they were either too steeply priced or were not usable in a manner that would ensure returns to these enterprises. The cost of such machinery, such as baling machines, scales and trucks were pointed out as being out of reach for most start-up cooperatives. At

Senwabarwana, different fundraising efforts took place over time leading to all the prerequisite machinery and equipment being provided for the cooperative.

4.3.2.4 Transport challenges

Most waste collectors could not afford to transport their recyclables to the market due to the costs and distances involved. As a possible solution, the interviewee suggested that cooperatives, especially those in remote areas, could negotiate with long distance trucks that might travel along their way so that when they go back to Johannesburg, they could load their collected waste material to maximise on their income. In this case study project, a deal was made with the middlemen/buyers to come through and collect waste at specified intervals. This had a negative effect because of receiving reduced income due to the buyers' factor in their transport costs.

4.3.2.5 Cash flow control

The interviewee from PETCO also identified one of the challenges as being the cash flow. This is brought about by the lack of understanding finances, budgeting, minimising costs and long-term planning by cooperatives. This resonates with what was identified at Senwabarwana, which further prompts one to ask if the cooperative model was the best model in waste management, or some form of strong business focus was necessary to realise success in the field.

4.3.2.6 Ownership and entitlement issues within cooperatives

The interviewee also indicated that as PETCO, they too tend to have problems in dealing with cooperatives, as usually there are ownership and entitlement issues by one or two members. Once such challenges exist, the cooperative/recycling business would then be affected. This also boils down to a lack of education on how the business structure of a cooperative operates. Once the fundamentals are missed, the business itself is bound to suffer.

Telephonic interviews were also conducted on 24th of June 2015 with the buyers directly involved with the project to establish what their position is regarding problems associated with semi-urban initiatives. One of the buyers indicated that although his business was relatively established, he constantly faced cash flow challenges. This would in-turn affect how he was able to pay his clients, including the cooperative, whenever he collects waste materials from them. He pointed out that in order for him to get the best prices from the end buyers, he required volumes great enough to send through to the market, and in some cases when the volumes are not adequate, he had to delay sending off the waste for selling. The other buyer also stated that volumes were key to the success of his business, especially when he has to travel to Senwabarwana to collect waste. His requirement to curb this problem was to set a

minimum tonnage of waste to be collected per trip (whether baled or loose material) so that he is able to cover his transport costs.

4.3.3 Conclusion of findings for Objective 2

Through the different methodologies used, including the questionnaire, face-to-face and telephonic interviews, it can be concluded that the findings differed from interviewee to interviewee. The interview with LEDA focused on how cooperatives functioned and were formed (usually for the wrong reasons), whilst the interview with the representative from PETCO focused on the sustainability of recycling businesses and the operational challenges they faced. Though a similarity was observed when the representative spoke about entitlement issues, with the observations made regarding the cooperative model as an ideal business model, the findings were vast and varied, but all the more valuable in understanding the dynamics in waste recycling initiatives. Consolidating the needs of business owners (buyers), how the waste collectors might be a solution to overcome some of these challenges are to be considered.

4.4 OBJECTIVE 3: To assess the municipal policy and operational framework on waste recycling including challenges faced in waste management

This objective analyses the municipal framework that exists in waste management and recycling in Blouberg Local Municipality. Such an analysis is relevant to this study as it helps bring into perspective the developmental processes of the Municipality in relation to the recycling project examined in this study. The extent to which the project conforms to the developmental framework within the Municipality, particularly in the waste management area, will also be looked into in this objective. Secondary data and information reported in the draft Integrated Waste Management Plan (IWMP) and the Integrated Development Plan (IDP) of the Municipality was assessed. These two documents had already been considered. The IWMP has not been adopted as yet and only a draft version could be analysed. In addition, a face-to-face interview was conducted with a representative from the Municipality in order to gain more data on the status of the Municipality's framework on waste recycling and management.

It was established that the Municipality does not keep track of waste that is generated within Senwabarwana and, to this extent, no records of waste were available to assess. However, they do keep track of the frequency of waste collections that they do in the different areas. The key findings of the relevant topics are offered in bullet form later in this chapter.

4.4.1 Blouberg Local Municipality draft Integrated Waste Management Plan (IWMP)

4.4.1.1 Introduction and background

In the Plan's foreword, the Mayor identifies five problems, which he says constantly comes to the fore from the community whenever they have outreach programmes. These include poor road conditions, water supply, poverty, unemployment and waste management. This foreword sets the tone of what the community has identified as being relevant and crucial to their day-to-day lives. Of importance and relevant to the study are the last three issues stated above, namely poverty, unemployment and waste management and if linkages exist amongst the three based on the recycling project.

Still considering the background to the Blouberg Municipality's Integrated Waste Management Plan is the inclusion of what is identified as the minimum requirements of the IWMP, which include a description of the population and development profile of the area, an assessment of quantities and waste generated, the services provided for the collection, minimisation, re-use and recycling of waste and the number of persons in the area currently not receiving waste collection services. The plan does highlight the population dynamics within the Blouberg Municipality. This is quantified for the whole area and also broken down into the different wards.

The draft plan **does not, however, quantify the waste generated**, but attempts to qualify the waste that the Municipality currently collects from its residents, referred to as general household waste. There is also a description of some of the waste collection methods applied by the Municipality, to include the fleet of waste collection vehicles and use of a tractor. However, efforts in waste collection used at the buyback centre, to include the trolleys and the customised donkey carts, were not incorporated in the draft plan of the Municipality. These methods, as alluded to earlier and as will be shown further, contribute to collection, thereby assisting to address the waste backlog.

4.4.1.2 Priority developmental areas

One aspect that could also be gathered from the plan was what the Municipality identifies as the priorities for the Blouberg community based on the community consultative exercise they undertook in the 2013/2014 financial year. These areas are given in order of priority as economic development (job creation and partnerships), human resources, institutional development, roads and public works, water and sanitation, sports and recreation facilities, rural development and urban renewal, and finally environment and waste management.

Economic development and jobs are the main priority, whilst the environment and waste management are ranked the lowest, thereby in the last position. With some of the findings from the first objective, the case study could potentially be linked to economic development and job creation. Environment and waste management issues could be elevated to dominate the Municipality's developmental agenda in the same manner that job creation and economic

development dominate the list. During the evaluation of the Municipality's Integrated Development Plan, the Municipality indicates that the reason why environment and waste management issues are ranked last is the lack of partners to develop a framework for a waste management agenda within the Municipality. The draft Integrated Waste Management Plan does mention the role of the P.E.A.C.E Foundation in setting up the recycling centre and how the beneficiary cooperative is running the Centre. However, the Municipality neither quantifies nor qualifies the potential impact this intervention has. The IWMP is still a draft document and has thus not yet been adopted as the official document.

4.4.1.3 Status quo of waste management

The draft plan also has a status quo on waste management within Blouberg Local Municipality. This quantifies the number of settlements within the Municipality, the population and the percentage backlog when it comes to waste management. The total number of settlements within the municipality is 123. The plan cites Stats SA's 2007 Community Survey as having shown the population of the Municipality as 194 119 with 35 598 households. However, the 2011 Census showed that the population had dropped to 162 629 but the households had increased to 41 192 (Statistics SA, n.d). The IWMP refers to the Municipality as having a total of 21 wards with varying population figures. The least populated ward has 5 318 inhabitants whilst the most populated has 15 188 (Senwabarwana) inhabitants. Senwabarwana is the only ward with population figures above 10 000 having a bearing on the waste volumes generated. This suggests that the buyback centre is currently located in the most ideal and conducive ward and has the potential of acting as a central waste recycling site for the other wards (depending on the distances involved).

From what the Municipality classifies as 123 settlements, waste collection is rendered to 11 settlements weekly whilst Senwabarwana and All Days, which have the highest population densities, receive the service daily. The draft plan also cites Statistics SA based on the 2011 census that 22% of the settlements receive waste removal services compared to 2% in 2001. This is a marked improvement, however, there is still a backlog of 78% where waste collection is currently not rendered. With the Municipality's cooperation, this backlog can be addressed considerably, as the recycling buyback centre makes use of donkey carts to collect waste in some of the wards that have a backlog. Waste that is not being collected by the Municipality can be collected by the community itself and brought to the recycling centre in exchange for cash. The use of donkey carts was not mentioned in the draft IWMP, but through the waste data generated on site it can be highlighted that the carts are helping in the waste collection process. Recyclable materials collected have increased considerably owing to the use of the carts, and if further implemented on a larger scale, this can even address the problems the Municipality faces in waste collection.

According to the IWMP, there are also 19 industrial bins located in Senwabarwana. The IWMP is silent on industrial bins in other noted areas and also the availability of smaller bins for the general public. The P.E.A.C.E Foundation was able to purchase a total of fifty 210 litre drums for the Municipality in order for them to be converted into bins. Photograph 4.2 shows one of these converted drums. Previously, the Municipality did not have bins for the public to use except for the industrial bins mentioned here.

4.4.1.4 Challenges in waste management within Blouberg Municipality

The plan also goes on to mention some of the critical challenges which it says are hindrances into achieving its waste management goals. These include resource capacity, geographical and spatial make-up of the Municipality, community education and gaps in the bylaws. The characteristics of the Municipality as predominantly rural, affected the Municipality in conducting its waste management duties.

Since the IWMP forms part of the Integrated Development Plan (IDP), the IWMP also has a section which it makes reference to the specific key performance areas in waste management as given in the IDP. The plan shows that the waste management objective was to provide waste management and refuse collection to 100% of all households by 2014. An interview with the Director of Community Services from the Municipality was conducted to find out to what extent they had been able to fulfil their waste management commitments. The results are summarised in Table 4.1.

***Table 4.1*: Summary of progress of strategic points within the IWMP**

(Source: Modified from Blouberg Municipality IDP, 2015)

Strategy point	Progress as of April 2015	Comments by researcher
Development of a waste management roll-out plan	The roll-out plan has been structured and is currently being implemented at different levels	The plan deals mainly with waste collection and landfilling, but does not deal with recycling. An interview with Director of Community Services showed that recycling was on the agenda for the Municipality but challenges are faced in rolling this out, particularly due to financing.
Establishment of compliant licensed landfill sites	The 2011 status quo still prevails, that is the Senwabarwana dumpsite is not licenced and the All Days landfill is licensed.	No change was observed based on observations. Interview with Director of Community Services yielded results showing that plans were on the table to have the landfill at Senwabarwana licensed. The process was to tender to identify a service provider.
Provision of regular waste collection	Waste collection has been expanded and serves more households than in 2011.	The town of Senwabarwana looks aesthetically smart and pleasing. Waste is being collected but, due to transport constraints, could not observe waste collections beyond Senwabarwana. An interview with the municipal official yielded a conclusion that more could be done with regard to waste collection.
Purchase and maintenance of additional waste bins, waste compactor and waste plant.	Waste bins have now been provided. Compactors still need to be purchased.	Bins in the town of Senwabarwana were provided by P.E.A.C.E Foundation. Prior to this move, no bins were set up save for the big skip bins located at the bus terminus and near some shops.
Provision of environmental awareness of the	There is a section of 'green activists' within the Municipality that is dedicated to waste	Some of these activists were seen before but mainly at the municipal offices. The recycling centre has not been exposed to the municipality's environmental awareness

detrimental effects of waste.	education. This stems from the provincial government.	efforts. There is room to integrate efforts of the Municipality with those of the recycling centre, for instance, having regular clean up campaigns to promote waste recycling as opposed to dumping and landfilling.
Sustaining the use of existing municipal EPWP workers to roll out the function	The workforce has increased because of this.	It was observed that EPWP participants cleaned up in Senwabarwana at different intervals of this study. However, all waste would be sent through to the local dumpsite and there was no cooperation with the recycling centre. Potentially, the EPWP workers can be applied to promote waste recycling and the recycling centre's impact on the community.
Integrating the CWP and EPWP and the use of municipal staff in the waste programme	The integration has been made and there is a great staff compliment in the waste collection system.	It was not possible to ascertain if this is beyond Senwabarwana. However, as mentioned earlier, the plan focuses on waste management more than it does on recycling. Hence, the relevance of the buyback centre or recycling in general and its benefits on the environment and socio-economic aspects are not visible in the plan.

4.4.2 Conclusion and findings for Objective 3

In conclusion, based on the analysis for this objective, the Municipality has a good framework that can potentially assist in sustaining the recycling centre if properly coordinated. Challenges faced by the Municipality were identified and outlined but potential solutions or short- to medium-term plans to address some of the challenges in waste management are not indicated in the IWMP. The framework is ideal as a waste collection and disposal plan, though emphasis on the benefits and importance of recycling are not fully addressed. Recycling of waste is part of how waste is managed and, with the waste hierarchy as basis, the waste management plan does not fully address waste management in an environmentally friendly manner that would promote avoidance, re-use and recycling over landfilling.

The role of informal waste collection activities (current and potential), are not addressed at all, which gives the impression that these activities are non-existent in Senwabarwana. Though the Municipality welcomes the P.E.A.C.E Foundation's efforts in recycling (through the buyback centre) and waste collection using donkey carts, the contribution of the case study is neither qualified nor quantified. Therefore, no long-term plans are mentioned as to how the Centre may be potentially integrated in waste management issues within the Municipality.

An opportunity exists for the Municipality to harness what has been developed at Senwabarwana, and roll it out to other areas where waste collection and recycling is not being conducted. For example, integrating the use of the donkey carts and trolleys introduced by the Foundation to provide waste collection services. This is cost effective and environmentally friendly and is replicable in the most remote areas within the Municipality. Waste collected can be brought to a central point for sorting and eventually sent through to the recycling centre for selling. This has the potential to stimulate more informal waste collection activities. This case study could form the recycling arm of the IWMP, which will facilitate integration of informal waste collectors into the formal waste collection process in Senwabarwana. Integrating the

recycling centre into long-term municipal plans (IDP and IWMP) will be essential in how waste is managed at a community level in Senwabarwana.

4.5 OBJECTIVE 4: Analysing waste data generated at buyback centre to determine how much waste is being recycled through Centre and how much income can be generated

This objective looks at the waste data generated at the recycling centre based on the records that are generated and kept there. The waste data has a direct bearing on the environmental impact of the project as this shows how much waste is processed through the buyback centre, thus how much waste is being diverted from the landfill site. This is also an indication of the nature of waste generated in Senwabarwana and to an extent, the quantities of waste that can be recycled in the area. The Ndumo case study has shown the importance of recording waste data, particularly in determining how much income can be derived from selling the recyclable waste materials. Unlike in the Ndumo case study where no data capturing was done, the current case study records all waste that is collected and brought through the Centre because collectors are paid per kilogramme of waste they bring in. The case study has different facets that integrate business principles, environmental issues and job creation at different levels, yielding varied outcomes.

4.5.1 Waste volumes captured at the beginning of each quarter since August 2014

The operations spreadsheet was used to establish the waste volumes captured at the recycling centre. The spreadsheet under review begun to be used at the centre towards the end of July 2014, and therefore August was used as the first month to be analysed. It must be pointed out that only the third months' data were analysed for this research. These months were selected randomly based on the fact that they marked the begging of each quarter. To this end, it was anticipated that the flow of waste between the four identified months would give an understanding of how much waste was captured through the recycling centre as they covered different seasons within the natural calendar (spring, summer, autumn) and ends towards the beginning of winter in South Africa. The other months analysed are first to last day of November 2014 (start of second quarter), beginning to end of February (start of third quarter) and the whole of May 2015 (beginning of fourth quarter).

4.5.1.1 Waste generated in August 2014

August was the first full month captured by the operation's spreadsheet. It details all the waste materials anticipated to be collected at the centre and what was actually brought in per waste stream of which only the total was recorded. For the month of August 2014, cardboard (k4) appears to be dominant in all four weeks, totalling 1.343kg. Cardboard is readily available in Senwabarwana due to the retail shops in the area, which mostly receive stock in boxes. There

is an informal arrangement between the cooperative and the Boxer, enabling the cooperative to collect cardboard when the material is available. White paper fluctuates between 38kg and 119.5kg yielding a total of 282kg. Polyethylene terephthalate (PET) also displayed a low collection rate with a total of 241kg.

As was mentioned in PETCO's newsletter of June cited earlier, the global drop in the price of oil directly affected the price of PET locally and abroad. In the case of this research, this meant that the cooperative could not market their PET, as few buyers were willing to trade in the commodity due to the skewed pricing. As a result, it was resolved that all collectors would stop collecting and bringing PET until the marketing of it was resolved. However, since the beneficiary cooperative was paid a flat monthly wage, which was not dependent on the waste volumes they collected, they would continue to collect the PET so as to accumulate volumes until the material could once again be traded. This then would explain the reduced quantities of the material as shown in Figure 4.23.

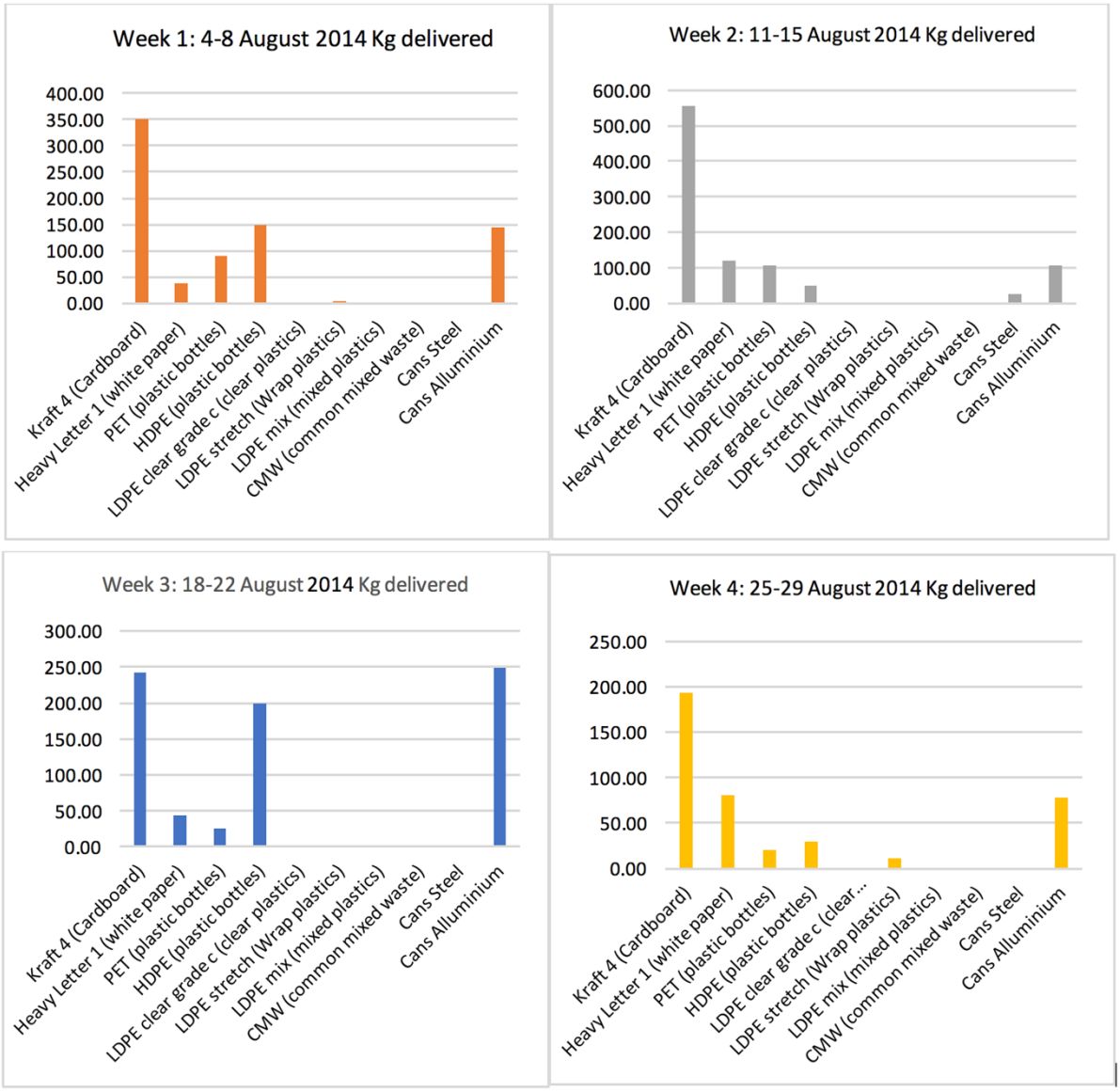


***Figure 4.23*: Waste collection volumes for August 2014**

(Source: Personal Analysis of data)

Aluminium cans collected rose in the third week reaching 249kg. The other three weeks show that the volumes of these cans was lower. In total, the cans reached 577.5kg. This volume also potentially gave the cooperative the most income in the month, since aluminium cans are bought at R4/kg, the highest price offered for all the materials traded at the Centre. A total of 429.5 kg of high density polyethylene (HDPE) was collected, whilst only 15.5kg of low density polyethylene was brought to the Centre in August. The other waste materials are not recorded for August, and thus this indicates that they were not collected or traded at the recycling centre in August 2014. A total of 2,913.5 tonnes of mixed waste were processed at the recycling centre during August 2014.

4.5.1.2 Waste data generated in November 2014

This month marked the beginning of the second quarter based on the operational spreadsheet. The data found in the four weeks of November are shown below in Figure 4.24.

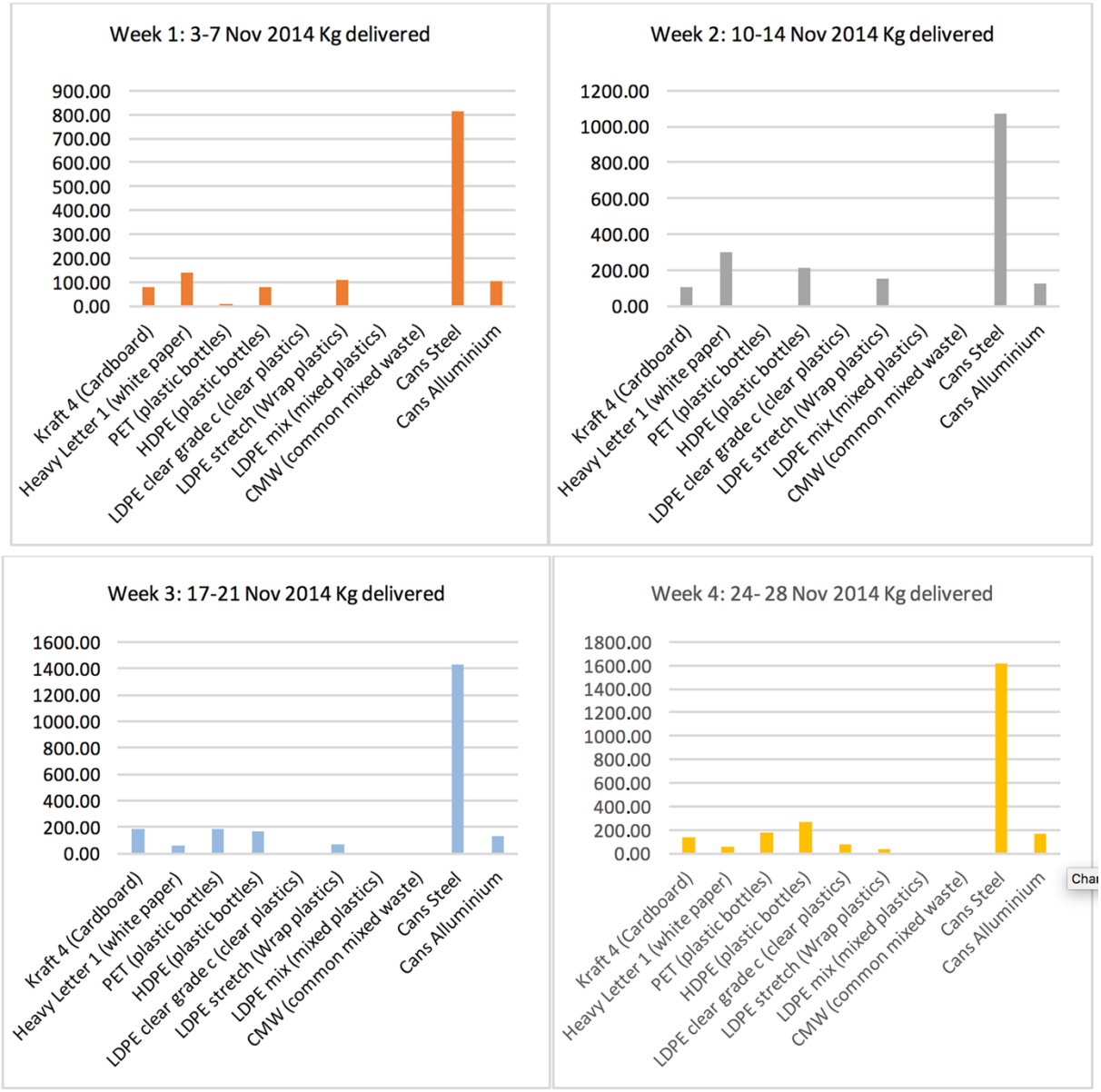


***Figure 4.24*: Waste collection volumes for November 2014**

(Source: Personal Analysis of data)

From the data, cardboard (k4) collections went down to 506kg. White paper collected and processed at the Centre was 548kg, which almost doubled from the month of August. Some sources of the paper were the Municipality and Senwabarwana primary school, with the potential to further increase the tonnage from other government departments, such as the South African Police Service (Senwabarwana) and the Department of Justice which indicated

that they were willing to provide the Centre with white paper on the basis that all the paper is shredded on site first.

However, an increase of 266kg was recorded if one is to compare the months of August and November 2014. White paper is largely used in offices, and in areas, such as Senwabarwana which have an increasing commercial activity in the form of retail shops, and administration services in the form of government departments. Increased volumes of white paper could be realised depending on whether more sources are supplying the waste or on the consistency of supply from the current suppliers.

A major increase in steel cans was observed in November, with a high of 4,935.5kg, the highest single waste volume for a waste stream recorded in that month. The use of donkey carts in waste collection had started in October 2014 which means an increase in volume could be realised. These carts can comfortably carry between 100-1000kg of waste depending on the donkeys being used. A detailed analysis of the waste quantities based on the donkey carts will also be done. Aluminium cans collected were recorded as 525.5kg. In total, 8,039 tonnes were collected in the month of November 2014. This means 8 tonnes worth of waste that was originally destined to be burnt, dumped or landfilled was however diverted for recycling.

4.5.1.3 Waste collected in February 2015

The next month to be analysed is February 2015, shown in Figure 4.25.

From this secondary data, three waste streams are dominant namely polyethylene terephthalate (PET), steel cans and aluminium cans. A total of 1,131.5kg of aluminium cans was collected, whilst 1,706.5kg of steel cans was processed at the centre. PET had a high figure of 1,150.5kg. Through observations, more waste tends to be produced during holidays in Senwabarwana, such as in December as most people would have travelled back home for the holiday season.

More disposable income is also available due to the presence of the urban folk, who would either be present in the rural and semi-urban communities for the December- January holidays, or would have sent money back home to the families back there for the Christmas holiday. The waste materials with the highest volumes in February normally contain beverages, such as soft drinks, mineral water and alcoholic drinks, which are often consumed based on one's buying power. If this is compared, for example the 465.5kg of cardboard that was processed, one can see that the difference is mainly due to consumption and buying power brought about by the holiday season.

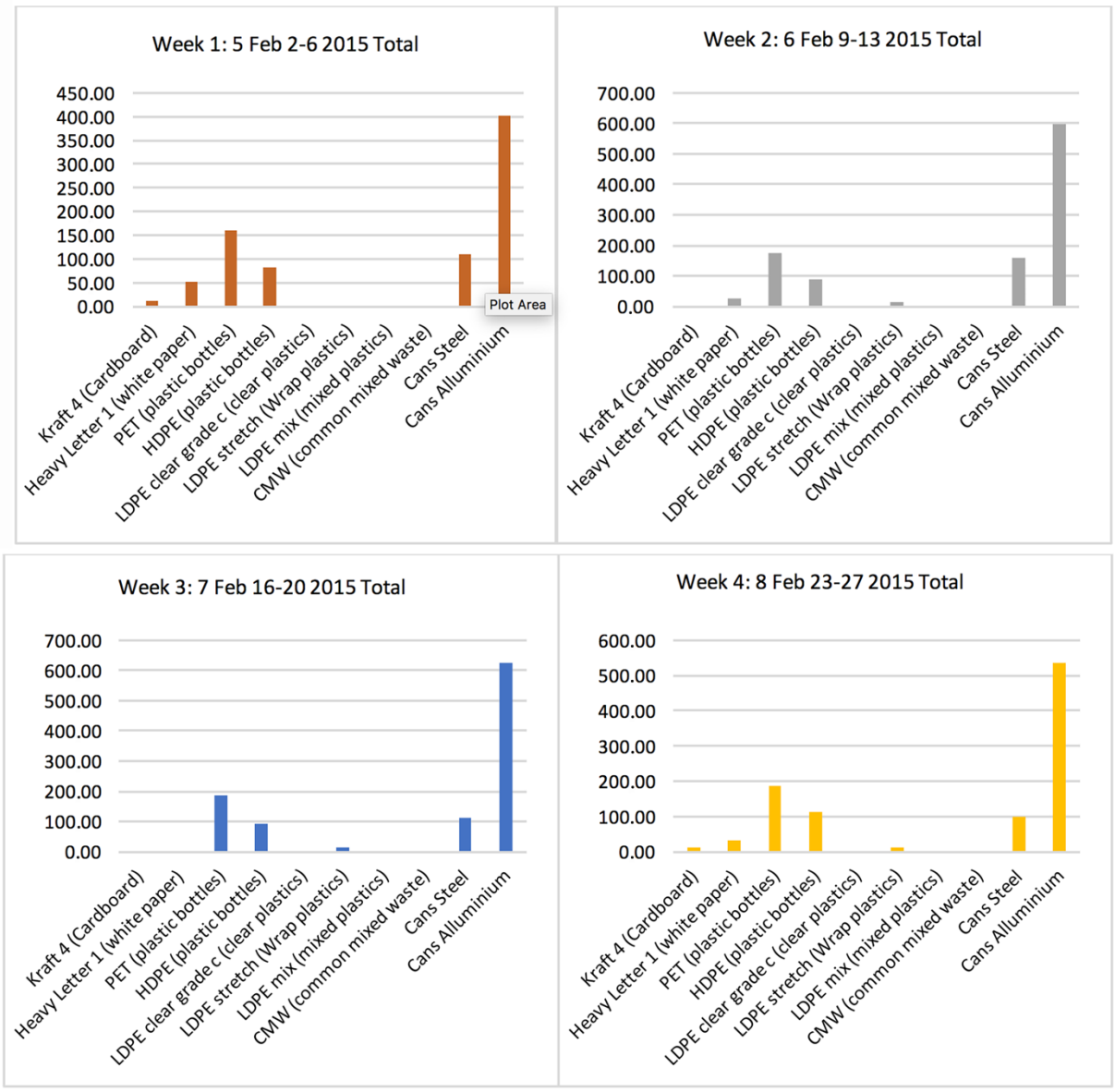


***Figure 4.25*: Waste collection volumes for February 2015**

(Source: Personal Analysis of data)

4.5.1.4 Waste collected in May 2015

During May 2015, a total of 3,974.2kg was collected and processed at the recycling centre (Figure 4.26). As seen for the other months, the totals vary based on the different waste streams. A total of 741kg of cardboard were collected and processed, which is a significant increase from the previous month of February that had 465.5kg. There had been negotiations with some of the *spaza* shops in Senwabarwana, who were willing to set aside some of their waste materials, including cardboard, for the cooperative to collect. Whitepaper still had a low collection rate, with 245.5kg collected, whilst HDPE that is usually used in homes (packages toilet detergents) was constant from the previous month, with a 20kg drop to 571kg in May. Both steel and aluminium cans dropped as well, with 570.5kg of steel cans processed at the

Centre down by 1136kg from the previous month and a total of 940.5kg of aluminium cans was processed at the Centre.

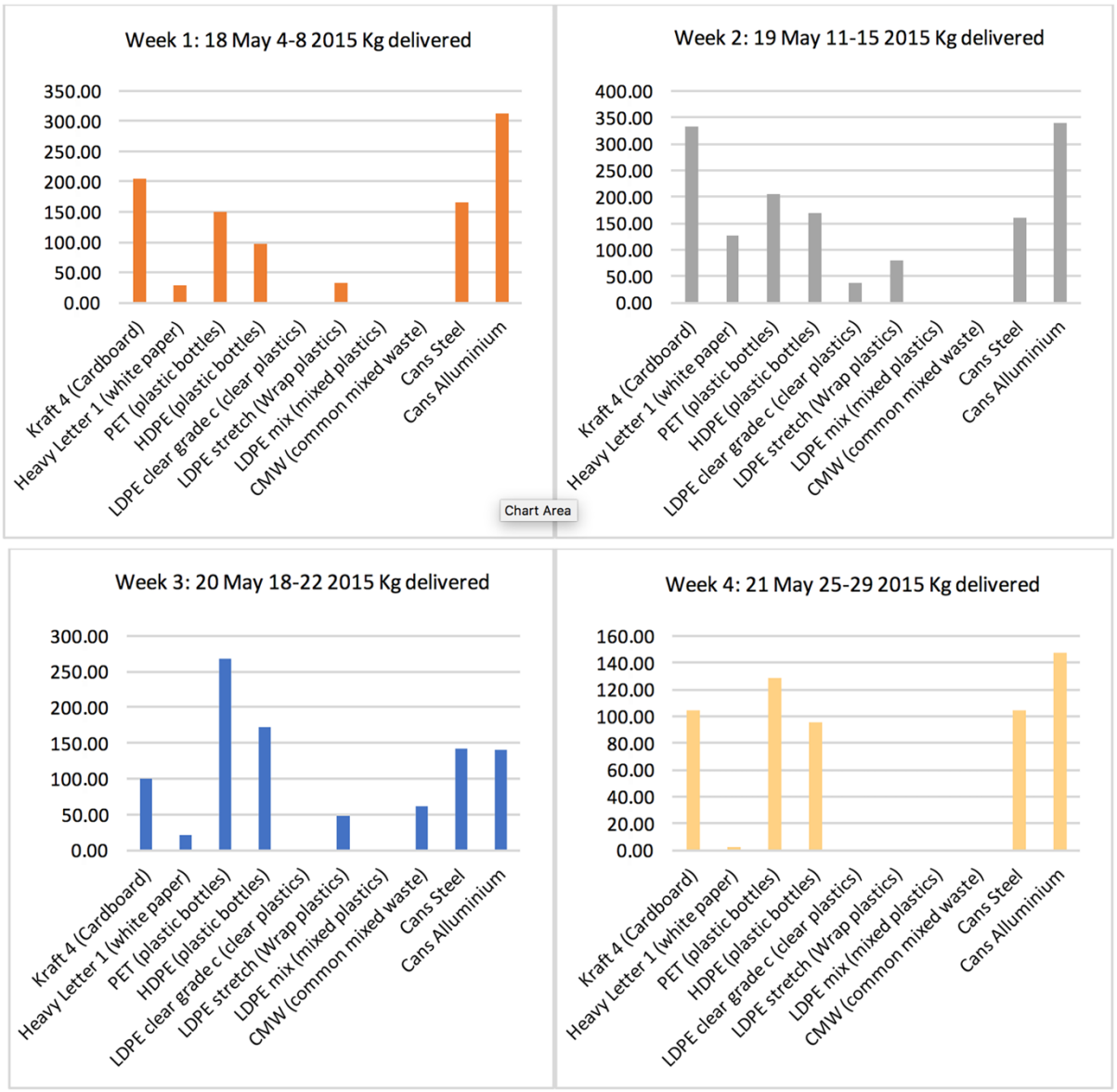


***Figure 4.26*: Waste collection volumes for May 2015**

(Source: Personal Analysis)

4.5.1.5 Conclusion of quarterly data

Based on the data provided of August and November 2014 and February and May 2015, it can be concluded that waste is a commodity that fluctuates as can be seen in the volumes brought to the recycling centre. During holiday seasons (for instance in November) and soon after such periods, for example the December holidays, waste volumes tend to be high owing to a higher purchasing power within communities. An analysis of the kinds of waste materials reclaimed during this time shows that volumes of plastics, particularly PET bottles are indicative of what

types of beverages people will mostly consume during this period's festivities. On the other hand, the fact that during December and part of January, the donkey owners, who are casual collectors for the cooperative, went on holiday means that the recycling cooperative was incapacitated to capture most of the waste volumes as well, and thereby lose out on capitalizing on the holiday festivities and the waste they tend to generate. In future, a way will be recommended in which collections using donkey carts or the cooperative vehicle continue particularly during the holiday period, as this will also influence the sustainability of the recycling centre, since waste supply is high during such periods. The recycling centre can easily increase their income drastically, if they operate at full capacity during seasons where waste supply is high.

Capturing of waste data is essential, as these records directly influence the income of the buyback centre. These records enable payment of the waste collectors, who bring in waste and they are paid per kilogramme of the waste they bring in. The waste data itself enables some form of quantifying of how much waste can be recyclable in Senwabarwana, and qualifies the types of waste materials that can be recycled in the area. Potentially, this data can be also used by the Municipality as a build up to how they can also keep and record such data, because this was not being done at the time of conducting research. The data, however, is not reflective of the total waste that is being produced, as it is selective of only recyclable materials that can be traded at the Centre.

4.5.2 Waste brought in by different waste groups to recycling centre

Different forms of waste collection are being used in order to sustain the recycling centre with adequate waste volumes to enable sales. These collection methods are divided into categories according to distance as illustrated in Figure 4.27.

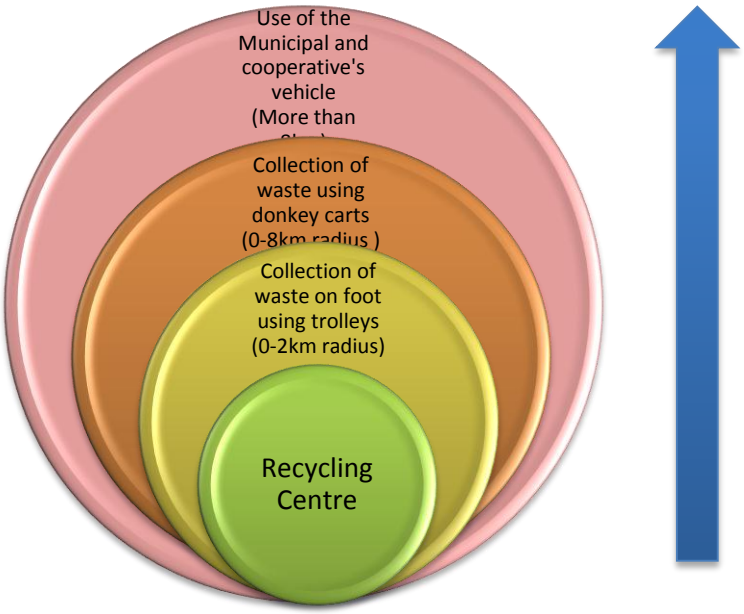


Figure 4.27 **Waste collection strategy** (Source: Personal drawing)

All waste collection methods are aimed at increasing waste volumes that can be sold at the centre thereby increasing the viability of the recycling centre as a central hub of economic and social development. In the process, jobs are created in the informal waste collection sector and livelihoods are sustained through buying and selling waste. From Figure 4.2.7 above, a team of waste collectors uses trolleys to collect waste within a two kilometre radius. This covers some areas within the Senwabarwana business district. The donkey carts collect waste within town and the adjacent village, which are all within 8km. This distance was recommended by a veterinary surgeon and animal rights activist who is contracted to offer her services to the project on an ad hoc basis. Based on her insight, this is the recommended distance to be travelled by a working donkey each day. In this case, working donkeys would be defined as donkeys that are used to collect waste and deliver it to the recycling centre.

A vehicle donated to the project (including a trailer) was to be used to cover an area beyond 8km. The dumpsite is approximately 4km from the recycling centre and all waste collected and sorted from the dump (by the waste collectors and the cooperative) is brought to the Centre using the municipal truck. This distance was ascertained by driving through to the dumpsite from the centre, and using the odometer reading on the vehicle used. Integration of the three modes of waste collections has an impact on both the sustainability of the Centre and the socio-economic development of this region. Jobs are created, income is generated, waste is recycled and diverted from being dumped, whilst central to everything, is the running of the recycling centre as a sustainable enterprise.

***Photograph 4.13*: Waste collection methods** (Source: Personal Image)

All the collection methods shown in Photograph 4.13 are integrated and work in tandem. The top left Photograph shows the collection using trolleys, the top right depicts the use of the donkey carts, the bottom left image is the municipal compactor delivering materials on site, while the bottom right image depicts the newly purchased project vehicle.

Volumes collected per each group will be shown using a chart which makes it easy to analyse the data. The secondary data used was from the month of August 2014 to May 2015, based on the operational spreadsheet that captured data from the last week of July 2014. The data is represented in Figure 4.28 for comparison purposes.

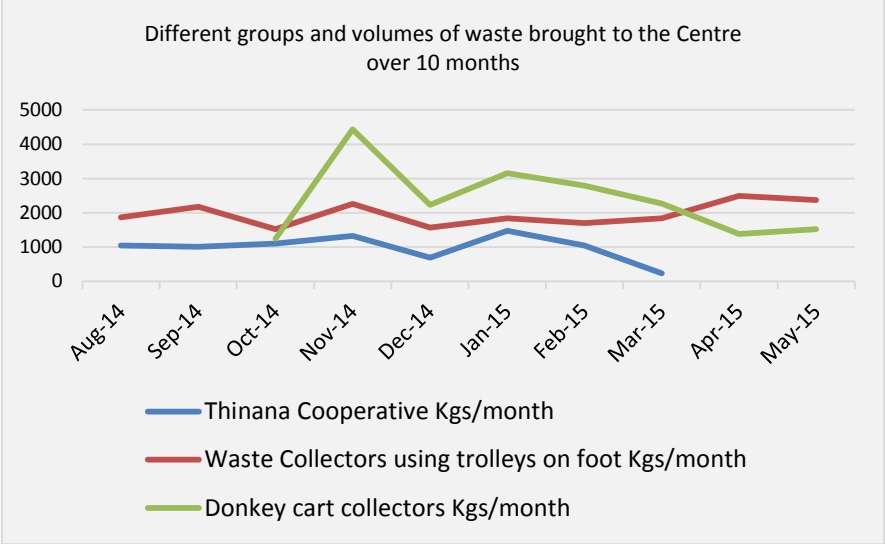


Figure 4.28 **Waste volumes brought in by different collection groups**

(Source: Personal Analysis)

The beneficiary cooperative collected the least amount of waste. This is in part due to the payment model currently on site, as the cooperative has a guaranteed monthly income of R600 regardless of the effort they put in, which is different from the other two groups that get paid based on the waste they bring in. This approach can put individuals in a 'comfort zone', where their income is guaranteed monthly, and not necessarily based on their output. Those advocating for cooperatives argue that cooperatives exist to offer a service to their members, who continue to have an influence on the cooperative's function to help enhance incomes and improve viability on business activities (Ortmann & King, 2007). It may be ideal to pay the cooperative members per kilogramme of waste as well, to encourage them to collect more waste.

Between the months of October 2014 and May 2015 the donkey carts brought in the most waste, bringing in a total of 19038.3 kilogrammes of mixed waste. Based on these figures, this shows that the donkey carts themselves have contributed to the running of the recycling as

they are able to bring more waste than the other collectors. Access to the project's financial records were gained. The increased waste volumes are also directly related to an increase in income, as the recycling centre is sales driven. The donkey carts have little to no cost of running as they are animal driven. They therefore become an ideal mode of waste collection especially for a community project, such as the case study centre, which is in its initial phase.

The overall waste collected and sorted on site based on the data generated at the Centre is shown in Figure 4.29.

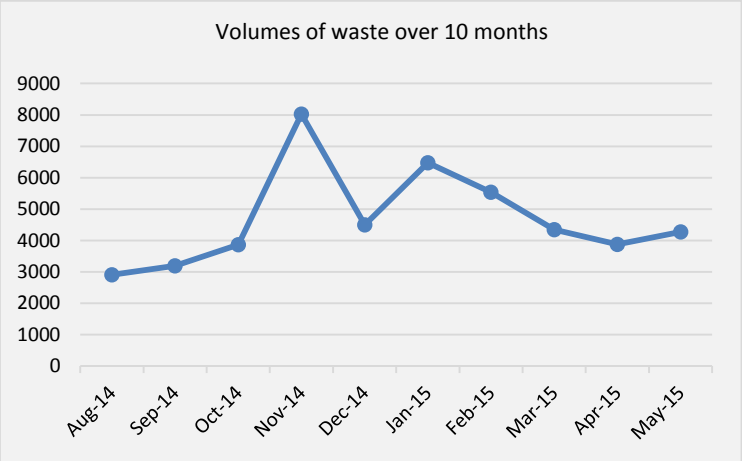


Figure 4.29 **Total waste volumes over ten months**
(Source: Personal Analysis)

Although the data from August 2014 are accurate, they have a shortcoming, as they do not provide recordings of waste from February 2014, when the Centre first started operations. All the waste streams were only captured accurately after the involvement the other buyer (Newronment), who came up with an acceptable selling price structure. For this reason, on the financial cash flow side, the spreadsheet records reflect a negative balance, as data from previous months were not captured. However, from Figure 4.29, the following conclusions can be drawn regarding the waste volumes on site.

- There was a sharp increment in waste processed at the Centre from October which can be attributed to the implementation of donkey carts, which complemented the use of trolleys. The donkey carts cover a longer distance have a bigger carrying capacity than trollies and thus have potential to collect more waste
- Waste generation fluctuates and one of the reasons this is so is the community's buying power and in instances seasonal holidays. There was an increase in waste processed in November, which marks the beginning of the Christmas holiday season. Beyond March 2015, the volumes began to drop with a slight increase in May.

- There was a drop in waste collected and processed in December 2014. The donkey owners went on 'leave' during this month, and this affected how much waste could be brought in at the recycling centre since the cooperative only had the trollies to rely for transporting waste. This further indicates that the donkey carts have a huge impact in the collection process at the Centre and thereby giving merit to their usage especially in waste collections in semi-urban areas such as Senwabarwana.
- On average, a minimum of four tonnes can be collected and sorted on site each month. Considering that only a small distance is covered by both the donkey carts and trolleys, it would be essential to see the impact the vehicle will have on waste collections, when the cooperative starts to make use of it.

4.6 OBJECTIVE 5: Solutions for problems and recommendations for acceptable semi-urban recycling practices

The fifth and final objective of this research puts forward possible solutions to some challenges identified within the case study project in order, possibly, to replicate similar projects in other semi-urban areas. After observing objectively, these solutions are based on facts and findings from this study.

4.6.1 Role of strategic partnerships in waste recycling and process of scaling

It is important to have public-private partnerships in place as the different public and private or civic society players all have different roles that complement one another. The three major parties involved in the case study project are the P.E.A.C.E Foundation, as the project proponents and funders, Thinana recycling Cooperative as the beneficiaries and the Blouberg Municipality as the support agent to the project. All three parties have defined roles and as such, one of the reasons why the project has been able to go beyond the first year of operations is, because of this partnership structure. Based on assessment and direct experience it can be noted that the partnership has not been easy to maintain, but it has been able to yield positive results. As an acceptable practice, it would be ideal for informal recycling initiatives to foster such partnerships, as there is potential for the informal recycling sector to be integrated into the formal waste management sector.

4.6.2 Ideal business model and potential of cooperative model

One challenge mentioned regarding the recycling centre in Senwabarwana was to make the cooperative structure an ideal business model. The interview with the representative from Limpopo Economic Development Agency (LEDA) concluded that one reason why cooperatives are deemed to fail in their operations is, because the members do not fully understand the

cooperative model. Figure 4.30 provides a solution as to how best the cooperative model might work.

Although this structure was designed for an agricultural initiative, the same principles still exist even in the recycling cooperatives. The primary tier (primary cooperative) has the responsibility of the day-to-day operations and, within the recycling project, would be responsible for waste collection, sorting and ensuring that the business operations are smoothly implemented on a daily basis. The business operations (secondary tier) in the context of the case study project would be split between the P.E.A.C.E Foundation and possibly other industry-related stakeholders, such as PETCO and the buyers, whereas the strategic planning aspect can include an amalgamation of NGOs and waste picker associations. If properly implemented, this structure can also be useful in other cooperative structures as enterprises.

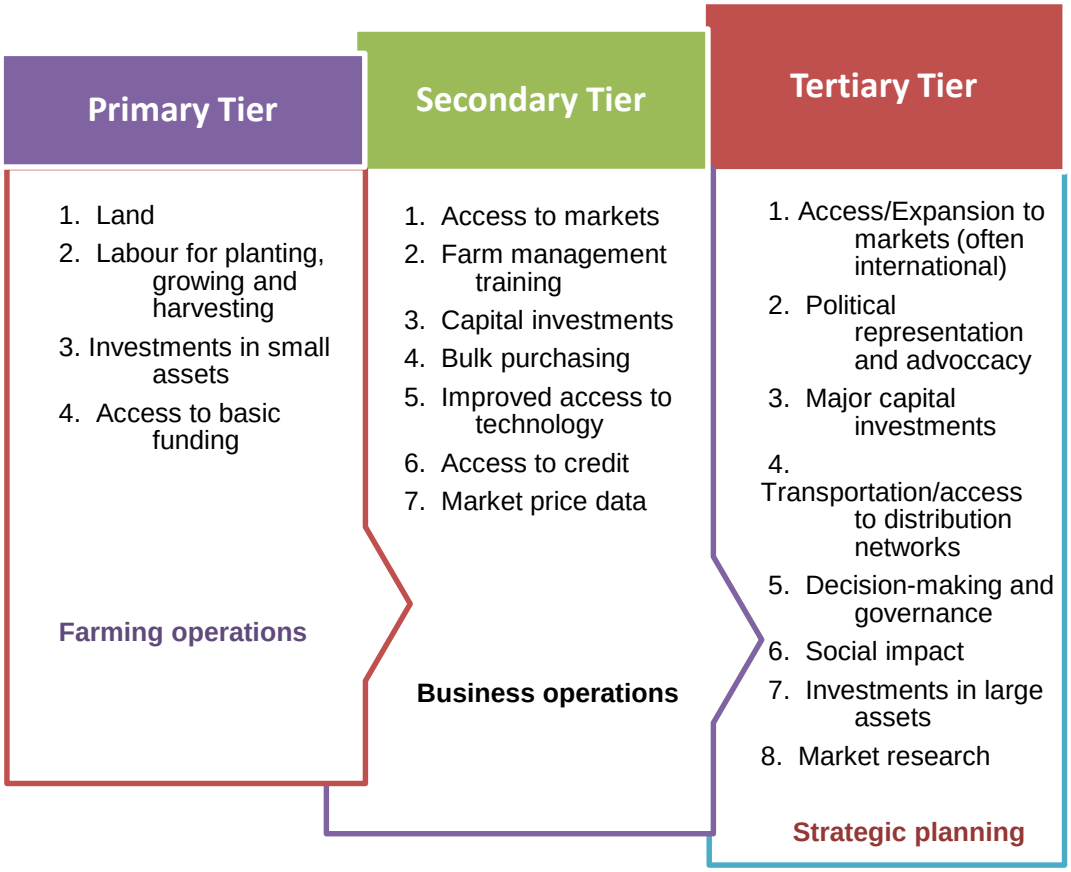


***Figure 4.30*: Cooperative business model**
(Source- P.E.A.C.E Foundation and Berkeley University study, 2011)

Overall, the roles provided by each tier increases in scale, and it therefore becomes difficult for the primary tier to do what the tertiary tier does, as often such skills may not exist within the primary tier, as is the case with the beneficiary cooperative. The direct involvement of the

second and tertiary tier in the first tier is also essential, because this helps nurture the primary tier. Therefore, this structure is proposed as a possible good-practice in recycling initiatives run by cooperatives, as a potential solution to the many challenges the cooperative structures often face.

4.6.3 Innovation and collaboration in waste management business operations

For informal waste recycling initiatives to maximise on their social, economic and environmental impact, there is need for them to be innovative in how they structure these operations and collaborate with one another. Some of the challenges, based on this research, include the role of the middleman in acting as a market, transport problems and inadequate waste volumes generated in certain communities or captured by the recycling entities or collectors. Based on this, as an acceptable practice, it is proposed that where possible and applicable, the collectors collaborate with one another as an innovative way to overcome some of these challenges.

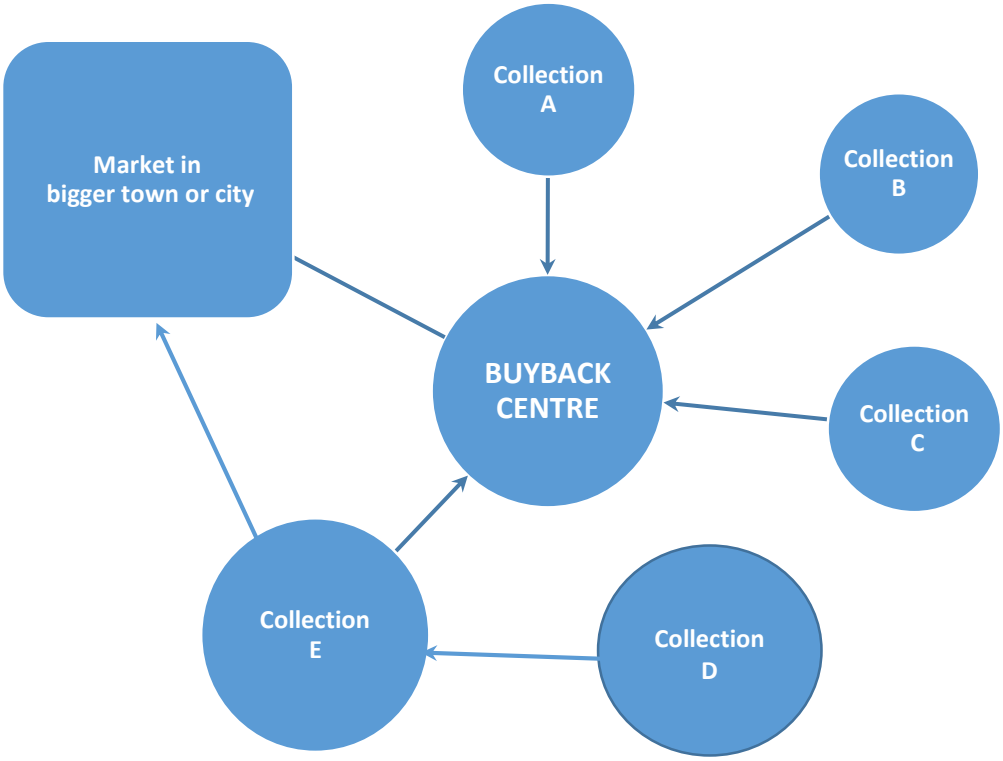


***Figure 4.31*: Networking of smaller collection points**

(Source: Personal Analysis)

From Figure 4.31, collection points A, B and C, because of their limited waste volumes, sell directly to the central buyback centre. The centre can either collect directly or have the means to bring in the waste themselves. However, collection point D is combining its waste with point E, and in so doing, maximising volumes at point E. Depending on the volumes, the two points

can either then send off their waste to the buyback centre, or bypass the centre and sell directly to the market. Costs are shared and because they have more volumes, they have potential to generate more income, which they can share, based on recyclable materials sold.

A similar arrangement can also be obtained through the three tier cooperative structure as discussed earlier. Regarding transport issues, the case study project can be used as an example in saying it is ideal to make use of the most available resources within a community, such as harnessing animal drawn power through the use of donkeys and donkey carts. When transporting waste to the market, small enterprises can also attempt to negotiate with haulage trucks (often where there are big retail stores which bulk buy from centralised locations in metropolitan areas) who often deliver retail goods to stores in rural and semi-urban areas and then go back to their main depots empty, or even some taxi drivers who might have trailers so that they can pay a minimal fee for delivery of their collected waste to the end buyers who are usually in cities. This enables the small businesses to get the best market related prices, which enables them to realise full potential on the socio-economic and environmental aspects of their operations.

4.6.4 Need for more research within the informal recycling sphere and academic input especially within feasibility aspects of semi-urban recycling

Not enough research has been done regarding informal waste recycling in semi-urban areas in South Africa. As a result, limited information exists to better inform those involved in such activities of the challenges and opportunities that exist. There is a need to continue building on this current research to understand how semi-urban waste recycling initiatives can be developed and expanded, in the same manner as they are in urban areas.

4.7 CONCLUSION

Results of the first four objectives show that the case study, though it impacts mainly on those directly involved in it, can positively influence the study location of Senwabarwana and other communities within the Blouberg Municipality. The case study worked mainly with the informal waste collectors, but has an element of being formerly organised owing to the use of the recycling buyback centre. There is an opportunity to include this case study into the broader municipal waste management strategy, which will enhance the impacts of the recycling centre beyond the current study location. Semi-urban waste recycling can positively contribute to sustainable development of an area and can also be a poverty alleviation tool if properly coordinated. The recycling centre has a community development component to it, which strategically positions it to not only be part of the municipal waste management, but the broader developmental framework as well. This is because the Centre, through waste recycling, can

offer solutions to such challenges as unemployment, poverty and development, which emerge as pressing challenges in both the IWMP and IDP of the Municipality.

The role that the P.E.A.C.E Foundation is playing in both assisting the informal waste collectors and harnessing support from the Municipality, indicates that there is potential to roll out similar initiatives in other semi-urban areas within the Municipality. The business sustainability element of the Centre is equally important, if the case study is to alleviate poverty and contribute to development in the study location. Currently, the Centre has created 14 permanent jobs, which provide waste collectors with a steady flow of income on a monthly basis.

Chapter 5

SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1 INTRODUCTION

This chapter summarises the key findings of this study, and provides recommendations for both academics and those involved in planning both in the private and public sectors. The research investigated the role of the informal recycling sector in a semi-urban area, with a particular focus on the operations of a recycling buyback centre and how it affects those who conduct recycling in the location used for the case study. One major question that the research assessed was whether informal waste recycling contributes to poverty alleviation and sustainable development of semi-urban communities. The case study centres on a recycling buyback centre in Senwabarwana.

Findings from this research have shown that informal waste recycling contributes to both the sustainable development of semi-urban areas and towards addressing poverty issues through income generation and job creation. There is also an opportunity for municipalities to engage with the informal recycling sector, as there are avenues where these two (municipalities and collectors) can complement one another in managing waste. The structuring of these informal recycling initiatives, however, is key to achieving a positive influence, since semi-urban areas face different challenges that affect where waste is generated, how it is generated and the amount of waste that can be recycled. However, there is a need to conduct further research, since at the time of conducting this research, the selected buyback centre for this case study was still in its start-up phase. The long-term sustainability of this project would be an avenue to research as part of the scaling-up process of the project.

5.2 SUMMARY OF FINDINGS

5.2.1 **Objective 1**: *To assess the sustainability of the P.E.A.C.E recycling buyback centre with regards to its social, economic and environmental impact*

A structured questionnaire was distributed to a sample of 14 respondents who work at the recycling buyback centre. From the questionnaire distributed, the social, economic and environmental impact and results can be summarised as follows.

- ***Social impact***: Based on the interviews conducted, the buyback centre has been able to provide permanent and casual jobs within the informal waste collection and recycling sectors. The cooperative running the Centre is the main beneficiary of the project with their team of waste collectors on foot and those using donkey carts being casual waste collectors, who help with the waste collections and are paid per kilogram for their work. Some respondents had not received formal training in waste recycling and they got their training from the cooperative, evidence of skills transfer provided at the Centre. Most of the respondents were employed in the informal sector prior to joining the Centre, and though some were collecting waste before, others were not collecting and only started after becoming involved with the Centre. The respondents also see value in collecting waste as they viewed it as rewarding, and 10 of the respondents indicated that if the Centre closed down, they would continue collecting waste. Regarding their needs, the respondents were split between emotional support (mostly the collectors) versus material needs (vehicle, baling machine).
- ***Economic impact***: There is a pricing schedule put in place at the Centre, with buying and selling prices for the different waste materials. The waste collectors and donkey owners are all paid according to the pricing structure, with only the beneficiary cooperative having a fixed monthly stipend/wage of R600. The respondents to the questionnaire had varied responses as to how they viewed their income, with some having earned more in their previous job positions prior to joining the recycling centre. However, 64% of the respondents earned less than R1000 prior to joining the Centre, indicating that the range within their income fell before joining the Centre has not changed.

  With reference to how income is allocated in their households, most respondents indicated that they put their family needs at the forefront before their own. This is seen in how they allocate their income on household expenses, children's education and other necessities in their homes. Whilst some indicated that they were able to pay for their children's education and medical bills from income they earned at the Centre, others indicated that they had made changes in their accommodation, all showing the positive economic benefits they are getting from the Centre. However, other respondents indicated that they have additional means of obtaining income, which included child grants, water fares and one respondent indicated she runs a tavern.
- ***Environmental impact***: These were assessed through direct observation and through administering the questionnaire to the 14 respondents at the Centre. The questionnaire had questions on whether there are any negative impacts of the centre on the community and whether the respondents observed any positive impacts of both the centre and of recycling. Being a discarded product, waste, if not managed properly, could potentially impact

adversely on the environment, particularly land and water sources. Though the Centre was only collecting three main waste streams (plastic, cans and paper) due to their financial viability, it was able to divert substantial amounts of waste material, which would otherwise have been either illegally dumped, burnt or landfilled in an environmentally unfriendly manner.

The use of donkey carts and trolleys may be regarded as environmentally friendly, as it makes no use of fuel that can release carbon monoxide into the atmosphere. Erecting bins, although not directly linked to the recycling centre, has had an awareness effect onto the community, as waste is no longer dumped in some hotspots, as was the case prior to setting up the bins. The respondents also viewed the Centre as having a positive impact on the environment. Ten of the respondents indicated they even advocate for either proper waste disposal or sorting of the waste. The manner in which waste is handled, sorted and baled at the Centre was also environmentally friendly, nevertheless, in some instances the waste is not baled. Waste is covered in bags or nets so as to reduce the risk of spillages whilst it is transported. The land where the Centre is located is ideal and does not pose any threat to the surrounding communities.

5.2.2 **Objective 2**: *To investigate the problems faced in rolling out semi-urban recycling and buyback centre initiatives*

Interviews were conducted to gather the opinions of stakeholders that included representatives from PETCO, LEDA and owners of businesses that bought waste from the cooperative. Each stakeholder involved in the case study viewed these challenges differently. Challenges observed by the waste collectors at the case study are similar to those given by the interviewee from PETCO, which indicated that, regardless of location, waste collectors have similar challenges. Direct experience with the project also yielded additional challenges, which in some cases corresponded with views provided by the representative from PETCO. For instance, issues to do with the cooperative model and entitlement issues, which may affect the operations of these cooperatives, were pointed out.

Another observation worth mentioning is the role of the middlemen within the waste management value chain. Though these middlemen offer lower rates when purchasing waste from waste collectors based on the pricing structure at the recycling centre, without adequate volumes, the recycling centre cannot sell to the end market, because of the various costs involved, of which transport is the highest costing point. Overall, overcoming these challenges is key to ensuring the sustainability of the recycling initiatives.

5.2.3 **Objective 3**: *To assess the current municipal policy and operational framework on waste recycling within the Blouberg Municipality*

Two key documents were assessed, namely the Blouberg Municipality's draft Integrated Waste Management Plan (IWMP) of 2013 and the master Integrated Development Plan (IDP) (2011-2016) that is reviewed annually. These documents were selected primarily because they focus on the plans of development and management of waste within the Blouberg Municipality where the study area falls under. They were also selected in order to contextualize the status quo and bring about relevance to the study as they have a bearing on the case study. The IWMP (Integrated Waste Management Plan), as gazetted through the National Environmental Management: Waste Act (Act 59 of 2008), forms part of the IDP (Integrated Development Plan). Waste management issues are still lowly prioritised by the Municipality, though there is potential to integrate them with poverty alleviation and income generation strategies, which have a high prioritisation. The draft IWMP does acknowledge interventions at the recycling centre, and ushering these interventions into the IDP will be important for the long term sustainability of Senwabarwana, being the case studied. However, there is room to improve on these interventions, particularly within the waste recycling space. The policy framework dealing with waste management and recycling issues within the Blouberg Municipality exists, but this framework has not been fully implemented. Informal waste collection activities are not mentioned, and recycling itself is largely seen as non-existent based on the IWMP. The integration of donkey carts into the waste collection process and the investment in recycling through the Municipality and what has already been created by the Centre, can potentially yield benefits which can further strengthen the current municipal framework and integrate Senwabarwana into the formal waste management framework of the Municipality.

5.2.4 **Objective 4**: *To analyse the waste data generated at the buyback centre and determine how much waste is being recycled through the centre*

Waste records are kept at the recycling centre by recording the information through the use of an Excel spreadsheet. The waste data is recorded and reconciled daily, when the waste collectors bring in the waste. Waste is recorded based on its different types (paper, cardboard, PET, HDPE, steel cans, aluminium cans). Keeping of the records is also an improvement in itself, as the Ndumo progress reports analysed showed that records of waste were not kept, which affected the management of the project. Records kept at the Centre also enable the different payments to be processed for waste collectors. The greatest challenge with the records is that they only give data of waste processed at the Centre, and not necessarily data of waste generated in Senwabarwana. This leaves a gap in the actual figures of the recycling rate facilitated through the buyback centre. However, for the sustainability and day-to-day operations of the Centre, these records suffice. The records also show that waste is a product that fluctuates in the amount that can be processed at the recycling centre, and the use of

donkey carts adds value to the recycling centre through bringing in more waste as they have a bigger carrying capacity than trolleys.

5.2.5 Objective 5: *To provide solutions to identified problems and recommendations to acceptable semi-urban recycling practices*

These solutions were given after objectively observing the challenges from the study's outcomes. These include the realisation of the importance of fostering partnerships in order to roll out effective waste recycling initiatives. Also, for cooperatives to operate sustainably, they need to understand and adopt sound business principles, including understanding how the different tiers of the cooperative model function. There is also need for innovation and collaboration among waste collectors themselves, if they are to overcome the challenge brought by middlemen, to enable them operate profitably and sustainably. The last recommendation provided covers the importance of further research in informal waste management activities in semi-urban areas, in order to build out the existing body of knowledge further.

5.3 RECOMMENDATIONS

5.3.1 Recommendations for further research

Further studies on the impact of informal waste recycling in semi-urban areas could include understanding the entire recycling value chain and how social and economic spin-offs can be realised throughout this value chain. What the study has established could be researched further, as the project increases its current sphere of influence. The current study focused on a small sample since the buyback centre was in its start-up phase. To this end, there is potential to further the study as the centre expands and grows within other semi-urban areas.

The current project is an expansion of the initial Ndumo project, thus proof of the concept now exists. If properly coordinated, informal waste recycling in semi-urban areas can offer positive socio-economic and environmental spin offs to the region and community. Further research can either continue to build on this current framework, or potentially focus on other informal recycling efforts. As discussed in the literature review section, most previous research was conducted in urban areas, thereby alienating semi-urban areas. However, results from this research have shown that semi-urban areas also offer opportunities for both the informal recycling sector and academics to develop the academic space and waste recycling industries in semi-urban areas.

5.3.2 Recommendations for public and private sectors

Government should consider integrating informal waste recycling activities into the mainstream waste management framework. Informal waste recycling and picking alike contribute to income generation and environmental protection and conservation (DEA, 2014). The case study has shown that the use of donkey carts to collect waste by the informal waste pickers can potentially yield positive results for the local municipality, which is struggling to offer waste collection services to a number of households within the jurisdiction of Blouberg Municipality.

Based on the findings, the donkey carts are cost efficient and have contributed by bringing in the most waste at the recycling centre. There is also room for the private sector to engage with the informal sector or the non-governmental sector to maximise waste recycling. For instance, this case study can form the basis for building a semi-urban model for informal waste recycling. However, the success of this model will be dependent on interaction with formalised waste buyers (middlemen or end buyers), who predominantly operate in urban areas. Integrating the two models (urban and semi-urban) and operating within an ethical and fair business environment, could provide solutions for most informal waste pickers.

5.4 CONCLUSION

This study was able to reflect on the research topic**, Potential to grow informal waste recycling in semi-urban areas: Case of the P.E.A.C.E. recycling buyback centre in Senwabarwana, Limpopo.** Based on the case study, it has been established that although still in its formative start-up phase, informal waste recycling is a sector that, if properly coordinated, can be grown in semi-urban areas. In order to enhance and realise impact from informal waste recycling, other forms of coordination, for instance, use of donkey carts, may be pulled together, which is not a site one is likely to encounter in an urban set up in South Africa.

Key to informal waste recycling is the impact it has on the socio-economic and environmental benefits. However, some form of organisation of informal waste pickers is essential so that there is a recognisable business entity. In this case study, a cooperative structure runs the recycling centre and offers buying and selling services to other waste pickers outside the cooperative. Waste recycling is driven by volumes of the ideal waste materials, as seen with glass recycling compared to aluminium cans. Above all, there is an opportunity for different stakeholders to become involved in informal waste management and having informal waste recycling becoming part of the developmental agenda within municipalities. Upon concluding

this research, the case study project was awarded a 2015 SEED Award[7], recognising its potential as an exceptional social and environmental start-up enterprise.

[7] Organised annually by SEED, which was founded by UNDP, UNEP and IUCN in 2002 at the World Summit on Sustainable Development held in Johannesburg to help grassroots enterprises in developing countries to enhance their social, economic and environmental benefits, thereby promoting entrepreneurship for sustainable development.

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ANNEXURE: QUESTIONNAIRE

Full name: …….

Gender: ……

Questions
How many people live with you in your household? How many of them are earning an income? How long have you been working for the cooperative?
Have you ever received training in conducting recycling activities? If YES, from which organisation? If NO, where did you get the knowledge for doing recycling? From other workers in the cooperative From community people I received no specific training OTHER
Would you need more training on some special issue(s)? If YES, please mention. (*If more than 1, please rank them in order, from the most to least importance).* Issue 1: Issue 2: Issue 3:
What was your previous job before joining the cooperative? *(Write "0" if unemployed).* If YES, to whom were you selling? If YES, what changed with the cooperative? Did you meet your expectations? If NO, explain why. Before, were you part of a formalised entity? such as: *("NA" if unemployed, "0" if NO)* A cooperative A company What would you do if the cooperative closed? I would continue to collect waste individually I would try to find another job or do what I used to do I would be jobless *OTHER*
Describe your job at the cooperative with three adjectives from the following: hard, dirty, unrewarding, rewarding, interesting Adjective 1: Adjective 2: Adjective 3:
How would you describe your job at the cooperative compared to your previous job non-related to waste management? (Write "NA" if unemployed before): More difficult Less difficult More stable Less stable Would you prefer to do another job for the same income?

What is your current income at the cooperative?

- Less than R1000
- R1000- R2000
- R2000-R3000
- R3000-R4000
- R4000-R5000
- More than R5000

How much did you earn before joining the cooperative?

- Less than R1000
- R1000- R2000
- R2000-R3000
- R3000-R4000
- R4000-R5000
- More than R5000

If 10 small rocks represent the money your monthly income at the cooperative (present 10 rocks in front of the respondent), how many rocks would you attribute to?

- Yourself
- Your husband
- Your children schooling
- Savings
- Family expenses (food, clothing, celebrations, etc.)
- Accommodation expenses

Since you started to work at the cooperative, is it easier to....?

- Pay for the children schooling
- Pay for the medication in case of diseases
- *OTHER*

Have you made any improvements in your accommodation thanks to your cooperative income?

Have you changed your activity since you work at the cooperative?

Today, do you have other ways to earn money?
If YES, please mention what.

Do you feel useful for the community?

Do you feel proud?

Has the following improved after the establishment of the buyback centre?

- Working conditions
- Capacity of influence/ decision
- Self-satisfaction

Do people come to you to ask about waste management issues?

- Never
- Sometimes
- Often

Do you think that recycling has an impact on the environment?
If YES, please state how it has an impact.

Do you think people in your community are aware of these impacts?

What are your reasons for joining the cooperative (being more efficient, more powerful, socialising...)? If more than 1, please rank them in order, from most to least important. Reason 1 Reason 2 Reason 3
What are your reasons for choosing an environment friendly- job? If more than 1, please rank them in order, from the most to least importance. Reason 1 Reason 2 Reason 3
Do you think the P.E.A.C.E buyback centre is contributing to improving recycling and waste management issues in your community? Are there any negative impacts of the buyback centre, either environmentally or on humans that you can identify? If YES, please specify:
Have you noticed any new health problem since you work at the cooperative? If YES, please explain:
Do you sometimes advocate for the following with people from your community? Sorting out of waste Throwing away waste only in dump sites Taking care of the environment
Are you confident in the future of the cooperative? What main difficulties do you face with the cooperative (any problem: relationship with the members, working conditions, wage, etc.)? Do you know many people that would like to join the cooperative? What are the needs of the cooperative to make it successful?